

Marine Engineering And Shipping Age

Vol. XXVI

SEPTEMBER, 1921

No. 9

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Enlarging Our Scope

WITH the main object of fighting for those conditions in the United States which will make it possible to successfully operate ships under the American flag, for otherwise they will not be designed and built in American shipyards, MARINE ENGINEERING has been gradually broadening its policy by adding more and more material relating to shipping legislation and ship operation.

In doing this we have in no way reduced the quality or character of the engineering articles, and we never shall. On the other hand the up-to-date naval architect and marine engineer knows that there is a close relationship between the construction of a ship and its machinery and the problems that must be met in maintaining and operating it. In order that he may design the most efficient and economical type of vessel he realizes that he must know the physical and traffic conditions of the berth on which she is to operate.

For the above reasons we are adding SHIPPING AGE to our title. It does not mark a radical change in our editorial policy but, rather, it is only a step in the natural development of the scope of this publication. The war and recon-

struction periods have brought new problems to shipping as well as to the industries and we shall meet them as they occur with the best articles that can be obtained from well known experts who are specialists in their particular field.

In making this change we believe that we are giving the subscriber to MARINE ENGINEERING an added service and that in the future the publication will be even more valuable to him than it has been in the past.

MARINE ENGINEERING has always stood at the top of the list of marine papers both in this country and in Europe and with this enlargement of scope it will stand pre-eminent as the *Marine Paper of the World*.

Buyers Marking Time

THE condensed opinion of a man who has just completed a world tour and who has made a thorough analysis of the conditions in all the principal cities in the interest of a steamship company is that the present depression in business is due to the action of buyers who are marking time in anticipation of further price readjustments. In this country the widespread agitation for reductions in the railway rates now in force on freight shipments undoubtedly accounts, in part, for the hesitancy of the buyers. It is known that a number of shippers have deferred moving goods in the expectation of lower transportation rates, in spite of the fact that there is no prospect of any early general reduction of rates.

However, the railroads and the Interstate Commerce Commission will probably reach an agreement in the near future regarding both domestic and export rates. Mr. F. W. Davies of the North Atlantic and Western Steamship Company has gone so far as to predict that there will be a decided revival of trading in the month of September and he bases this opinion upon the plans of leading Eastern merchants who are shaping their course to meet more favorable business conditions.

Government Contracts

THE Government has apparently suspended work on the major portion of the 1916 naval program and the Bureau of Construction and Repair in its monthly report posts the date of completion of these ships as indefinite. Congress authorized the construction of these vessels and the Navy Department executed contracts with the shipyards to build them. The shipyards entered into contracts

with hundreds of sub-contractors for machinery and equipment, and these sub-contractors in turn contracted for material.

We are in sympathy with efforts of the Government to economize, and acknowledge that it has a perfect right to scrap all programs that are under contemplation, but we are strongly opposed to using economy as an excuse for the suspension of contracts entered into in good faith. Where work has been started, and while it is under execution, a stoppage means financial loss and, in some cases, ruin. At this time it means that thousands of men must be laid off, personnel organizations must be broken up and equipment and material must be paid for and carried in stock.

If we do not enter into a satisfactory disarmament agreement, we will need these ships badly for the protection of our thousands of miles of seacoast. If we do arrive at an agreement, the position and wealth of this country demand that we supply as great a share of the international sea police force as any other nation. We will be criminally negligent in the present state of world affairs if we neglect to insure our country's safety and tranquillity, for we have not reached the stage where we may be sure that any nation or any group of men will arbitrate any question or issue that they have the power to enforce.

Criticism

CHAIRMAN LASKER told the House Committee on Appropriations that the Shipping Board fleet in the time it had operated had saved the country millions of dollars in freights and that if Congress and the press gave them half a chance they would put the Board on its feet. He is quite right in both instances. The Board has not only kept freight money in this country that would have gone abroad but it has, by holding its vessels at a high figure, prevented a series of financial shipping disasters that might have killed our merchant marine. It has been expensive for the taxpayer but our merchant marine is absolutely necessary and the Government is the only organization that is strong enough to carry the bag until normal trade is resumed.

Let us hope that Congress will grant the Board reasonable appropriations for it will cost us more in the end if it does not. But most of all let us hope that the press will do its part in educating the people on the relation of our ships to business prosperity rather than indulging in destructive criticism, which not only destroys our shipping but also the opportunity to market American time sheets abroad. Boiled right down, we cannot expect capital to invest in shipping ventures until we cease to poison public opinion with scandalous and sensational misrepresentations which give the impression that American shipping cannot be established on a profitable basis.

We venture to say that England's success on the sea is largely due to the support that it has received from the entire English people, and until America learns to give whole hearted backing to those men who make great personal sacrifices for the development of our shipping it has no one to blame but itself if our merchant marine is not successful.

In this connection, we cannot too strongly urge shipping men in their comments about their colleagues to give most

careful consideration to the effect upon the opinion of the American public and the world of criticism or inferences that are not of the constructive sort. We are sorry to note that the new Shipping Board finds it necessary or politically expedient to establish a zero mark as an index of the efficiency of the previous Board. Admiral Benson fought a great battle, single handed, without proper support and it can do no good to belittle his work, for we all know him to be a game fighter representing the best type of our naval tradition. The new Shipping Board has already accomplished a great deal but there will be plenty of glory for it, and certainly more enthusiastic support, if it dates the achievements of the Shipping Board and the Emergency Fleet Corporation from 1917 instead of 1921.

English Recognition of Mr. Schwab

ONE of our English contemporaries, the Shipbuilding and Shipping Record, in referring to the testimonial dinner given to Mr. Charles M. Schwab by his former associates in the United States Shipping Board Emergency Fleet Corporation, expressed the wish that Great Britain had been represented at this function. It was pleased to state that, when the Allied Nations considered ships a vital factor for the safety of the cause and the preservation of our civilization, Mr. Schwab, when he was responsible for the carrying through of the great shipbuilding campaign in the United States, did fine work for which this reception was a fitting recognition.

The construction of our merchant marine was the greatest industrial achievement of the war and we believe that Mr. Schwab is prouder of the fact that he was director general of the Emergency Fleet Corporation when this work was accomplished than of anything else that he has ever done. The tribute from a representative English shipping paper will be greatly appreciated by Mr. Schwab and his friends, and especially so in view of the fact that the ships he constructed are now competitors of the British merchant marine.

Employment Bureau for Engineers

OF equal interest to both employers of professional men and to engineers of every grade of training and experience is the recent establishment of an employment bureau for technical men by the Federated American Engineering Societies, 29 West 39th street, New York, which represents a combined membership of about 50,000, including the best and most representative professional engineers in the United States.

This service, which is rendered free to either party by the Employment Bureau, means much more to an engineer than a mere method of securing work, important as that may happen to be. It means that the Bureau through its comprehensive classification of records compiled from the applications received, which must contain both educational and professional experience, will be able to designate the right man to fulfill the special requirements of any particular position.

Although the poet probably did not have the engineer in mind when he wrote "Full many a flower is born to blush

unseen," nevertheless there has been a vast number of technical men who have never had the opportunity to engage in the particular kind of work for which they were best suited and for that reason, in many instances, they have failed to succeed; and it is also true that there has been many a firm and many a project that has failed for no other reason than an inefficient personnel. Therefore we look upon this service as the establishment of a reserve and a reservoir of potential economic wealth which will be mutually beneficial to employee and employer.

Tax on Yachts and Motorboats

THE present tax of ten percent on all pleasure boats, if sold for more than \$15, has had a destructive effect upon the yacht and motorboat industry. Not only has this industry fallen to a point where it is doing only about 30 percent of its pre-war business but, in view of the addition of a ten percent tax on top of the increased cost of labor and material, there are very few prospective purchasers in the market.

The tax is oppressive and discriminatory because the tax on automobiles, which is a competitive and much more powerful industry, is only 5 percent. They both furnish outdoor recreation but the yachtsman not only must pay 10 percent instead of 5 percent but he must also indirectly pay the special taxes upon the accessories and equipment which are installed in his boat.

When it is remembered that a total of 1,675 members of American yacht clubs volunteered their services to the Government in the great war and that their experience and skill as navigators and boatmen was invaluable, it ought to be apparent that the country should encourage this form of sport. The Naval Reserve needs the yachts and motorboats as well as the men who man them, and the Navy Department is well aware of the value of these craft as an adjunct to their warships.

But getting down to business facts, the tax is so oppressive that it destroys its own source of revenue. So long as it is retained the small boat industry will remain in its present stagnated condition. On the other hand, a far greater amount could be obtained through income and profit taxes if this oppressive burden did not stand in the way of the re-establishment of the yacht and motor industry on a firm financial and industrial basis.

Reduced Insurance

THE action of the Shipping Board in reducing the amount of insurance required to protect the balance due on vessels purchased from the Government should be highly commended. Although the new valuations, which are said to be \$60 per ton for vessels of the lake type, \$80 per ton for freighters and \$100 a ton for tankers, are probably higher than those for corresponding ships on which foreign shippers are paying insurance, these new values for insurance will have a marked effect on the operating expenses.

While it might be good business to reduce still further the insurance charges of our pioneer purchasers, the values quoted above are probably about as low as the Board could

safely go without special authority from Congress. As we see it, in case of total loss it will be better to replace a vessel from the Government's tied-up reserve—as we understand that these valuations are without prejudice to the original sales price—for it is very doubtful if our ships can be sold at the above figures. At any rate the Board would not have the authority to spend, say, \$120 a ton to replace a ship that was insured for \$80 and it would be ridiculous to expect shipping concerns, who, as Mr. Harriman puts it, were "game enough sports" to pay from \$200 to \$225 a ton for their ships, to contribute \$40 a ton more.

It is to be hoped that the action of reducing insurance values indicates that the Board is also in favor of adjusting the prices paid by our pioneer purchasers of government ships. It may be necessary to get permission from Congress to do this, but whatever body has the decision should remember that these men did more than agree to take certain vessels off the Government's hands; they risked their money and did their best to help establish our merchant marine. Considering the scarcity of shipping talent, we can hardly afford to risk losing their cooperation by extracting our pound of flesh.

Internal Combustion Steam Power

AN English engineer who claims to be the inventor of the thermo-electric method of ship propulsion now proposes to revolutionize steam engineering and particularly marine engineering by a new system called the super-Diesel internal combustion steam compressor method. He claims for this method a combination of all the advantages enjoyed by the reciprocating engine, the Diesel engine and the electric drive and at the same time a great saving in the weight and first cost of the propelling machinery.

The system consists of a multi-cylinder Diesel steam compressor as a power generator and a triple expansion non-condensing reciprocating engine to drive the propeller shaft. This compressor is of a special design in which steam is compressed by the under side of the piston on the down stroke while the internal combustion process working on the top of the piston produces the power. The compressed steam then goes to a high pressure receiver and from there to the throttle valve of the non-condensing reciprocating engine. After passing through the engine it goes to a low pressure receiver at about 10 pounds pressure and from there it is returned to the steam compressor and is regenerated again into high pressure steam. Incidentally it is claimed that the auxiliaries, steering engine, winches, windlass and even the heating system can be operated in a similar way, taking their steam from the high pressure receiver and returning their exhausts to the low pressure receiver.

For the initial low pressure steam and for the makeup a boiler of about 100 gallons capacity per 1,000 horsepower is claimed to be all that is necessary, for due to the small number of working parts of the system and the reduced number of glands the amount of the makeup water, it is claimed, will be very small. The inventor states that the exhaust from his super-Diesel compressor is only about 500 degrees Fahrenheit and that this heat is utilized through distribution pipes to heat lag the steam reservoirs or receivers.

Having thus nicely outlined a closed system from which

little heat can escape he goes on to state that old iron merchants should get ready for a big business for there will be no more use aboard ships for such things as boilers, condensers, air and circulating pumps, feed pumps and their engines.

Despite the fact that Professor Unwin estimated that only from 0.44 to 0.51 percent of the indicated steam power of a compressor when used on a large scale can be realized on the shaft of a compressed air engine, we do not wish to scoff at or discourage this inventor who, in his patriotic enthusiasm thinks that he has discovered a means of securing a permanent maritime supremacy for the British merchant marine. Neither do we feel justified in predicting that a material cannot be found having the heat refracting power of firebrick together with the strength of steel, which requisites appear necessary for a successful gas turbine, but we would like to have a look at this wonderful compressor before making plans to dispose of our boilers and auxiliary machinery.

Lloyd's Register Returns

LLOYD'S shipbuilding returns for the quarter ending June 30, 1914, give an interesting array of figures on the world shipping tonnage, both afloat and building. They show that the self-propelled sea-going tonnage of steel and iron construction aggregates 22,386 vessels of 54,217,000 gross tons on June 30, 1921, as compared with 19,061 vessels of 42,514,000 gross tons on June 30, 1914. If we include sailing vessels and wooden steamers the tonnage is considerably greater but the ratio between 1921 and 1914 is practically the same. By countries these returns show that, neglecting sailing vessels and self-propelled ships of wood and concrete, the British merchant marine consists of 19,288,000 gross tons as compared with 18,877,000 gross tons in 1914, a gain of only a little more than 2 percent in seven years. The British Dominions collectively have 1,407,000 gross tons as compared with 543,000 gross tons in 1914. The United States have 12,314,000 gross tons of this type of vessels as compared with 1,837,000 gross tons in 1914. Japan has 3,063,000 gross tons as compared with 1,642,000 gross tons in 1914; France has 3,046,000 gross tons as compared with 1,918,000 gross tons in 1914; Italy has 2,378,000 gross tons as compared with 1,428,000 gross tons in 1914; Norway has 2,285,000 gross tons as compared with 1,923,000 in 1914; Sweden has 1,037,000 gross tons as compared with 992,000 gross tons in 1914; Denmark has 866,000 gross tons as compared with 768,000 gross tons in 1914; Holland has 2,207,000 gross tons as compared with 1,471,000 gross tons in 1914; Spain has 1,094,000 gross tons as compared with 883,000 gross tons in 1914; Greece has 576,000 gross tons as compared with 820,000 gross tons in 1914; Austria Hungary has nothing as compared with 1,052,000 gross tons in 1914; Germany has 654,000 gross tons as compared with 5,098,000 gross tons in 1914; the collective increase is about 27½ percent.

From these figures and the 6,199,468 gross tons under construction in the shipyards of the world today it would appear that very little encouragement for the shipbuilding industry is in sight and, if we cannot look forward to an in-

crease in the volume of sea-borne trade, this outlook would indeed be dark. But there are some very vital facts which these figures do not show, and principal among these is the number of ships that are obsolete. Sir Owen Phillips has estimated this tonnage at about 8,000,000 and certainly the price at which some of these vessels have recently been sold appears rather low even for a ship breaker to offer. Lloyd's returns include everything that floats, but it is known that a large number of ships will never see service again. In the case of many more it would be cheaper to build new vessels than pay the high cost of repairing them. Furthermore, these returns do not show how many of these ships have damaged or inefficient machinery, in other words, how many will have to be re-engined and re-boilered. It does not point out that the increase in the use of oil fuel both on land and at sea has created over 3,000,000 gross tons of oil tankers which should not be included in a surplus comparison with the 1914 returns.

Finally, these returns should not give the world the impression that there is an over supply of all classes of vessels. For example, there are 2,000,000 tons less of passenger ships now than there were in 1914. This country has only 18 refrigerator ships and there are a number of special types of vessels of which there is not a surplus such as cable ships, light ships, ferry boats, etc., not to mention naval vessels which are not included in the above returns, which may constitute no inconsiderable portion of new shipbuilding contracts.

The Shipping Board Appropriation

IN cutting down the appropriation of \$100,000,000 requested by Chairman Lasker for the operation and construction of vessels during the next six months to \$48,500,000, Congress is adopting a policy that is "Penny wise and pound foolish." If Mr. Lasker is to succeed in transferring the government ships to private owners, he must have something more than ships to sell. That something is business over the new trade routes and increased business over the old. He must do what only the Shipping Board can do, aid our private owners to build themselves up to a position where they can buy the ships.

"If the Board does not do this," Chairman Lasker says, "we shall not have any operators or owners left in America who can buy these boats." Exclusive of wooden ships, there are 1,440 vessels in the Government fleet which is far in excess of the number operated by any of the old established and experienced lines in England. We feel that we are not going too far in saying that the task of successfully running this vast fleet would stagger the most efficient shipping concern and while we are not advocating that Congress continue indefinitely to grant large appropriations to the Shipping Board, we do believe that Chairman Lasker should be given, at least, a sporting chance of making good.

He took this job, at a great financial sacrifice, and after the President was unable to find another man of large caliber available. In addition to this, it is a time of unprecedented depression all over the world. Congress should make up its mind either to take the ships out and sink them or to grant a reasonable amount to keep them going.

Relation of Our Merchant Marine to Business

By Francis H. Sisson*

Under the stress of present readjustments, when economy and efficiency are the watchwords of the hour, we must be very careful not to lose our sense of proportion, and above all not to let distressing details obscure our vision of paramount principles. In a short-term period of deflation, we should not lose sight of the long-term constructive expansion which has been occurring in this great, virile, under-developed land of ours, since its settlement, and which will continue for centuries more. That, in fact, shcu'd be our point of view regarding all fundamental economic factors, not the least of which is our new merchant marine in respect to its bearing on our business prospects.

UNFORTUNATE as the mismanagement of the Shipping Board may have been, scandalous as may have been the waste of our heavily burdened taxpayers' money in acquiring a large merchant marine as a war necessity, they should not be confused with the vital, underlying question of the maritime future of this nation. We should remember that a large merchant marine, successfully operated by private interests, will play a very important part in our future prosperity.

GREAT BRITAIN'S LEADERSHIP

Great Britain's wonderful series of commercial conquests led directly to political empire in many countries. Her adventure in India had its origin in the enterprise of a great trading company and the initiative of her merchant sailors won for her, one after another, colonies and dependencies throughout the entire world. Her fleets were found in the most remote ports and one by one her sons established themselves in trading outposts in every rich dominion. Her iron and coal, her wool and other raw materials, coupled with industrial skill, gave scope for the development of manufactures. As her wealth grew, her interests abroad multiplied, and London became the financial center of the world, as well as the greatest of all clearing houses for commodities of every description from every country in the world.

Prior to 1914 Great Britain's position in shipping, in finance, and in trade was not seriously challenged by any other country, although Germany was striving to overtake her by efforts that were directed with great intelligence and combined all the powerful economic resources of that nation. Leadership in Germany had a complete comprehension of the elements that must form the basis of successful international commerce—a great merchant marine, foreign investments, banking and trading organization, highly developed domestic industries, and the control of supplies of raw materials, as far as possible, in the primary markets of the world. Her success in these efforts was so great that it will always be surprising to the future generations that she should have been willing to risk her assured position in the costly and ruthless speculation of the great war.

*Vice-president of Guaranty Trust Company of New York.

MUST DECIDE FUTURE POLICIES

The lessons of this record of the past are clearly written for those who study the present position of our own country. The United States, blessed with resources both natural and industrial that are beyond comparison, richer and more powerful than any other country, must now make the great

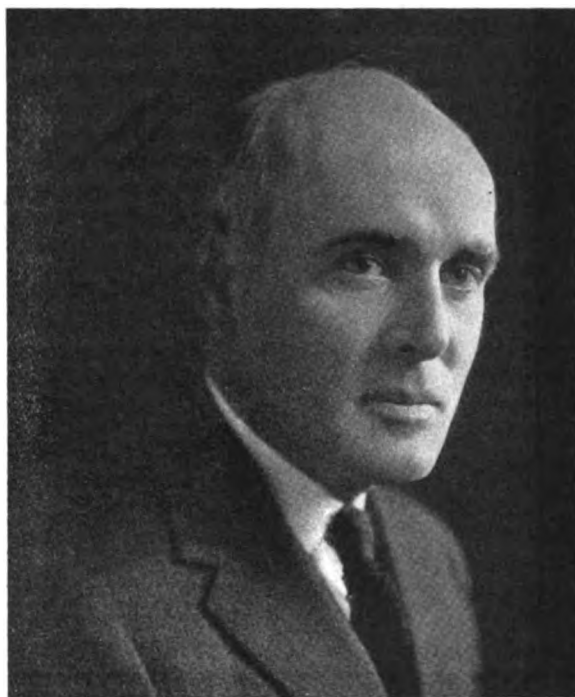
decision as to her future policies. All the weapons for peaceful and legitimate leadership are within her grasp. The war has strengthened the United States where she was weak. Her merchant fleet employed in foreign trade in 1913 was only 1,019,155 tons. Now it is second only to that of Great Britain and comprises some 15,000,000 tons.

Since our earliest days as a nation it has been a tradition, carried almost to extreme, that we should maintain a position of aloofness in international affairs, and this attitude has influenced our policies towards foreign trade and shipping as well. We have always had a foreign commerce, but never as a primary interest, as in Great Britain and Germany, where such trade has been vital to them for many years. Our own domestic market has been so great that it absorbed by far the greater percentage of our production of every kind and, similarly, the opportunities at

home for the use of capital for the development of our abundant resources have not only absorbed all our own surplus funds for investments, but have also drawn upon the capital of other countries, Great Britain especially, to a total of billions of dollars.

FINANCIAL POSITION CHANGED

It is true that mines in Mexico, Chile and Peru, the meat freezing plants in Argentina, Uruguay and Paraguay, and the paper industry in Canada, for example, have attracted several hundred millions of our investments abroad, but we were heavily indebted to other countries for capital they had loaned to us during many years. Today the change in this financial situation of the country is very marked. We have rebought a large proportion of our foreign-owned securities and, in addition, have loaned about fifteen billions to foreign governments and to municipal and private creditors, mainly in European countries.



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Francis H. Sisson

The Federal Reserve Act has given us a foreign banking organization that is quite adequate for the needs of our international position and is constantly being extended. The large American banks have numerous branches abroad, and in every country there are direct banking connections with New York. Whatever may be the development of our foreign trade, it will surely be accompanied by a similar growth and strengthening of this great financial organization, upon whose service must rest the orderly and successful conduct of overseas commercial transactions.

MERCHANT MARINE REVIVED

The record of the wonderful rebirth of our merchant marine is so recent and striking that it is known to everyone. For years we had been lamenting the fact that the glory of our great fleets of speedy clipper ships, which formerly carried the American flag to every port, had passed from the seas. But every effort to reestablish a merchant fleet had been defeated by a provincial political attitude towards the problem or by our national indifference to our position as a trading nation dependent upon commercial rivals for the transportation of our exports and imports.

Transportation is the link between the producer and the consumer—the means of bringing the goods to the ultimate buyer. More than ninety percent of the exports and imports of the United States are carried by water. America's future prosperity, therefore, lies largely on the seas. Shipping is the prime factor of international trade, and that nation is best equipped for such trade that has the best ocean-carrying facilities. For the first time in more than half a century the United States is in sight of the long-desired goal of transportation for the bulk of American products in American owned and operated vessels.

American vessels carried 94.2 percent of our imports and 86.5 percent of our exports in 1830. In 1860 these percentages had fallen to 60.1 and 70 percent, respectively. This diminishing continued until in 1910 only 10 percent of our imports and 7½ percent of our exports were carried under our own flag. The shipping losses of the Civil War depleted our fleets, and the absorption of our interest in the development of our internal resources and the competitive advantage held by Great Britain in the production and control of iron and steel ships led almost to our complete withdrawal from the high seas.

Our shipping legislation also, however well intentioned, actually operated to handicap the growth and movement of American owned shipping through the imposition of requirements and restrictions that rendered costs of maintenance relatively higher than those of our competitors. The exigencies of the war, however, forced upon us the construction of an adequate fleet and thus rounded out the national equipment for primacy in international commerce.

FOUNDATION FOR FOREIGN TRADE

Now we have all the foundation stones for any international trade structure that we may decide to erect. We have ships, a worldwide banking organization, illimitable capacity for production of both raw materials and manufactures, and capital resources far beyond any competitor. We have ceased to be a debtor nation and, in addition to a record of actual favorable trade balances of billions for the last few years, we shall have an invisible export represented by interest on the vast sums that have been loaned abroad.

High prices have been an important factor influencing this wonderful record of exports, but in spite of that element, the figures of our present trade disclose an unusual story of commercial activity. Vastly increased capital, ample shipping, and an enormous foreign trade were all the immediate result of the stimulus of the war, combined with our exceptional resources as an agricultural and manufacturing nation.

COURAGEOUS NATIONAL POLICY NEEDED

We are now at the parting of the ways. What are to be our policies in this new relation which we hold in the world of trade? All of the elements required to control and extend our commerce are at our command. Are we in the mood to seize this greatest of all our opportunities?

In fact, we must go forward, or we shall inevitably be forced to retreat from our present position with heavy losses all along the line—in shipping, banking and trade. We are already vigorously challenged by competitors in foreign markets. A courageous national policy of legitimately aggressive development of all these newly coordinated resources for the conduct of foreign trade is essential. Without constant initiative and positive effort we shall gradually be driven out of our advantageous situation.

There is no one American—merchant, manufacturer, banker, farmer or laborer—who has not some stake in this struggle. Our sales abroad of two billion dollars' worth of food products annually is a fact of importance to every farmer, either in direct interest or in effect upon prices. Exports of two hundred million dollars' worth of tobacco and more than a billion dollars in value of cotton add force to this argument.

Further, our vast industries when fully employed now produce such a surplus over domestic demands that loss of a foreign outlet for this surplus would mean serious labor depression. It is no longer true that we can look with comparative indifference upon our exports of manufactured articles as comprising too small a part of our total trade to be a matter of serious concern when they fall off. For many years the ratio of exports of manufactures to our total manufacturing production has been increasing, until now it has reached an amount that probably spells the difference between prosperity and failure in many industries.

DUTY RESTS ON ALL

The variety of our foreign trade is now so wide that an excess of production over consumption reacts upon every class of our population. The duty, therefore, of supporting our foreign trade in this time of readjustment to the more permanent conditions of the future, rests on every individual citizen—whose welfare and prosperity are not independent of the economic position of his country.

The fact that the time of our national political and economic exclusiveness has passed is being more impressively illustrated every day. We have done a great foreign business in the past, but we cannot expect the conditions of that business to remain stationary. We have sold vast quantities of our commodities to customers outside of our own country; we have extended them liberal credits and loaned them much capital. But it is obvious that there must be some limit to their buying power unless we in turn purchase what they have to sell in quantities equal to their purchases of goods and capital from us.

If we go on taking measures to prevent the sale of foreign commodities in our country, if we try to erect barriers which retard the flow of commerce, we will in the long run handicap ourselves and work incomparable injury to our future prosperity. Already we are seeing the products of field and factory piling up in granary and warehouse. The real problem, therefore, is the maintenance of the volume of our trade.

The future rests not so much on government and politics as upon the wisdom and sagacity of business men. Foreign exchange rates were "unpegged" by the governments concerned in their regulation in March, 1919, and in April of the same year it was announced that the United States would make no further advances to foreign countries. Thus the business of financing our foreign export trade is again in the hands of the American people without expectation of either the interference or the help of the United States

(Concluded on page 656.)

The Egyptian Cotton Controversy

Alexandria Episode Discloses Monopoly for the Exclusive Benefit of the British Merchant Marine

By Winthrop L. Marvin*

WHEN, more than a few years ago I was constrained to leave the decks and rigging of the fishing craft, the coasters and the tall square-rigged East Indiamen, where most of my active boyhood had been spent, for the pursuit of a different kind of learning than the sea had taught me, one particular vexation which I met in the college halls was a solemn book on political economy written by an English author from a very insular standpoint—how it came into a Yankee institution I could never understand.

This exotic work propounded, among other things, that the British people owed their great merchant marine solely to their national policy of "laissez faire," or, in other words, to free trade—that all that Britain asked was to meet her competitors "on even terms," "without artificial aid," in a spirit of "a fair field and no favor." It happened that I had direct information from ship merchants of my native port of the way in which Lloyd's with its powerful discriminations was driving the last of our Yankee clippers from the seas and I had acquired also some concrete facts concerning British steamship subsidies. All of this information was somewhat indignantly related in the presence of the professor and my classmates as an example of what "a fair field and no favor" had actually meant in maritime history. Whether it was my youthful emphasis or the unmistakable sea tan and rolling gait of the briny atmosphere from which I had emerged, I know not—but at the end of the term the offending British text book had disappeared from the curriculum.

A FAIR FIELD, INDEED!

So I cannot help smiling reminiscently as page after page of this present Egyptian cotton situation unrolls. No "artificial aid," a spirit of "a fair field and no favor," indeed! If there ever was a hard-and-fast monopoly for the exclusive benefit of British shipping, this Alexandria episode is certainly disclosing it—and it cannot be characterized as a mere reprisal for alleged discriminations of the Jones merchant marine law, for the Alexandria monopoly was in full swing years before the Jones law was ever heard of.

Undoubtedly we have not yet finished with this affair, for our Shipping Board, in the first round of its encounter with the Liverpool conference lines, has won only a half way victory, if any real victory at all. Let us review the various stages of the proceedings: First, the American (independent) Line, of the Harriman shipping interests, was told last year, when it applied at Alexandria for at least a part of the many thousands of bales of Egyptian cotton bought for the New England mills, that not a pound of that cotton could be sent over in American ships—that it had been going, and was to continue to go, to Boston or New York in nothing else than British bottoms. That is to say, this old-time maritime monopoly was absolutely sacrosanct!

SHIPPING BOARD, LOWEST BIDDER

But the American ambition to transport American property was not so easily downed. When the proposals were opened at Alexandria last May for the shipment of this year's cotton crop, there was consternation at the discovery that the American Shipping Board was the lowest bidder, not only for Egyptian cotton destined for the mills of the United States but also for cotton destined for the mills of the United Kingdom.

In cold figures, the American bids were 40 shillings per ton for the United States and 25 shillings for British ports, while the Liverpool conference bids were respectively 60 shillings and 40 shillings.

Of course, if actual, as contrasted with mere rhetorical, "fair play" had prevailed, the contract for the shipment of the entire Egyptian cotton crop for the period from September 1, 1921, to August 31, 1922, should have been straightway turned over to American steamers. But that is not the way the thing is done. Though the Egyptian producers wished to accept the American ships with their far more favorable freight rate, the British interests dominant at Alexandria would have none of it. Even when the Shipping Board offered a compromise proposition and declared that it would be content, if the American part of the business were awarded to American ships, to leave the British business to British ships, the olive branch was flatly rejected by the Liverpool lines' conference.

PARTIAL COMPROMISE

Then, of course, there ensued the deadlock which the subsequent meetings of Shipping Board representatives and British steamship representatives in London could not readily resolve. All that the British side will consider, up to this writing, is that American vessels may be vouchsafed, say, perhaps fifty percent of the Egyptian cotton shipped direct to the United States but the Americans can have no share of the considerable quantities which are trans-shipped via Great Britain. Thus the situation stands. One important interest, apparently, is quite forgotten. That is the American manufacturers who purchase this Egyptian cotton for use in their own machinery. These are the men who have to pay the bills. They can have their cotton delivered at a cost of 40 shillings per ton in American ships, but the Liverpool lines demand 60 shillings. What is especially disappointing is that cable advices declare that the Cunard Company is one of the British concerns most insistent on retaining the indirect cotton trade to the United States as a British shipping monopoly. This is a singular attitude for the Cunard management to take, in view of the extent to which its own ships have for many years participated in American commerce. What would be the reaction of this old British company to a demand that all American cabin travelers to Europe sail exclusively under the American flag?

LIVERPOOL LINES RESPONSIBLE

Is the Egyptian cotton episode destined to prove the Bunker Hill of a lively maritime conflict, which might be a long and a costly one but which could have but one ending? There are various reassuring circumstances. First, this unfriendly discriminative attitude toward American ships is not the result of an official act—it has no governmental significance. It embodies simply the arbitrary course of the Liverpool lines, which are alone responsible. Egypt is not, formally at least, a British possession. If it were, American public sentiment would not oppose an effort to reserve the carrying trade between Egypt and Great Britain entirely to British ships, precisely as we reserve our trade with Porto Rico and Hawaii and presently will reserve our trade with the Philippines. But though we maintain inviolate the coast-wise shipping policy of the fathers of the republic, we make no effort to confine to American ships the trade of Porto Rico with Europe or of Hawaii with Japan. We rightfully

*Vice-President and General Manager, American Steamship Owners' Association.

regard this as an international commerce, open to the ships of all the world.

There is no precedent whatever in American law or practice for the policy of exclusion which the Cunard Company and the other Liverpool conference lines endeavor to impose on American ships plying in the trade between Egypt and this country. A comparable act would be an attempt to forbid the export of our own Southern cotton to Liverpool and Manchester unless it were shipped in American steamers. Not only is such a policy not tried or contemplated but when the Lancashire spinners stipulated that their own purchases of our Southern staple must be delivered in none but British ships, and insured by none but British underwriters, Americans regarded these British manufacturers as acting within their rights, though scarcely in accord with the economic principles of Bright and Cobden.

AMERICAN MANUFACTURERS PAY EXTRA FREIGHT

Gradually the American people and their lawmakers are going to learn how jealously each of the maritime countries of Europe insists on guarding and promoting the interests of its national merchant marine—the one industry left virtually unprotected in overseas commerce by the United States. Just recur to this Egyptian cotton trade: The Egyptian fibre—of a length and fineness inferior to our own Sea Island product but superior to the ordinary upland cotton—is an essential material for the manufacture of certain valuable cotton fabrics, in which the mills of the United States have made extraordinary progress. This progress the rival manufacturers of Great Britain cannot prevent, but the ship-owners of Great Britain—the Cunard and other Liverpool lines—compel American manufacturers to bear the added cost of having their Egyptian cotton supplies trans-shipped via British ports, instead of being brought direct, forbid direct shipments to America and hamper our manufacturers by levying a 50 percent higher freight rate than the rate paid by the American vessels. Until the Shipping Board made its present determined fight, that was the actual American experience.

Now let us be wholly reasonable about this. If Great Britain, our chief manufacturing and maritime competitor, can so handle the ships of her vast mercantile marine as to force our commerce and our manufacturers to pay the tribute of discriminative freight rates or trans-shipment delays and costs on the materials or products of our greatest manufacturing industry—for in manufacturing America is easily supreme—Great Britain is entitled to do so if she can and as she has actually been doing in many more directions than this Egyptian cotton trade. But there is this outstanding fact, that we Americans will prove exceedingly weak and short sighted, if we continue to permit Great Britain to do this, now that for the first time in half a century we possess a great merchant shipping of our own.

IMPORTANCE OF SEA POWER

I am not writing in any denunciatory mood toward the British shipowners, or manufacturers, or merchants, or their Government. Our kin overseas are sharp, shrewd men with a most admirable devotion to the welfare of their own race and country. Their dearest ambition has been to rule the ocean commerce of the world, because they realize that control of the ocean is of immense consequence in peace or war. The incalculable value of such sea control was vividly impressed upon the American nation in 1914, when Great Britain and Germany, who between them were carrying most of our imports and exports, clashed in arms, to the paralyzing of our sea-borne trade and the ruin of a host of our farmers, manufacturers and merchants. The immense importance of sea power had been demonstrated on a smaller scale to our own heavy cost a dozen years before, when Great Britain, our principal carrier, in her South African war had

been able suddenly and sharply to advance her freight charges on our export and import trade, so that, in effect, the American people provided out of their pockets a large share of the money required to defeat and destroy the Boer republics.

These are two rather unfortunate passages in our national history. They are not going to be repeated, if the American nation upholds its Government in vital issues like this of the Egyptian cotton trade. There will undoubtedly be other points of difference and conflict before the other nations of the world finally realize that the United States is tremendously in earnest in its determination to maintain a merchant marine of its own capable of carrying the major part of its own ocean commerce. We do not begrudge other maritime peoples the possession of adequate merchant shipping facilities, with the indispensable building and repair yards, and a full force of seagoing officers and men. It is just as unfair and imprudent that any one nation should monopolize the sea carrying business of the world as that any one nation should maintain an army or a navy strong enough to overawe the world. Such an overwhelming power, on either sea or land, does not make for peace or good will among the peoples and the governments.

The 10,000,000 gross tons of registered shipping which the United States will possess when its wooden steamers are disposed of will equal substantially one-half of the overseas tonnage of Great Britain. These 10,000,000 gross tons will suffice to convey about 60 percent of the entire volume of goods which we sell to or purchase from the other countries of the globe. There is nothing sinister or menacing in the maintenance and gradual increase of a merchant shipping of this magnitude. It threatens no domination of the trade or the peace of any nation—and assuredly we shall accept no domination over our own.

Relation of Our Merchant Marine to Business

(Concluded from page 654.)

Treasury, except such as may be given by the revived War Finance Corporation.

The American dollar now stands at a premium in every important financial market of the world. And, in view of our foreign trade balances, therefore, an imperative duty rests upon every American who would see his country maintain its prosperity to take thought of how its future foreign trade may be properly maintained and profitably transported. Surely we have the energy and intelligence to solve the problem.

New Combustion Recorder Maintains Double Analysis of Flue Gases

A RECENT development in combustion control is embodied in the new type instrument known as the Duplex Mono recorder which maintains a continuous record of the carbon dioxide content and also the percentage of combustible gases present in flue gas. To obtain the highest efficiency from the operation of a furnace, the firing must be so adjusted that a proper balance between these two factors is maintained. The boiler from which the analysis shown in Fig. 1 was taken was operating at about its most efficient point as is evidenced by the high carbon dioxide content indicated by the white area and the low percentage of the combustible gases present represented by the light shaded area between the white and dark portions of the chart.

The instrument itself shown in Fig. 2 does not make use of any mechanical means to force the gas through the apparatus, mercury being used instead, which also performs

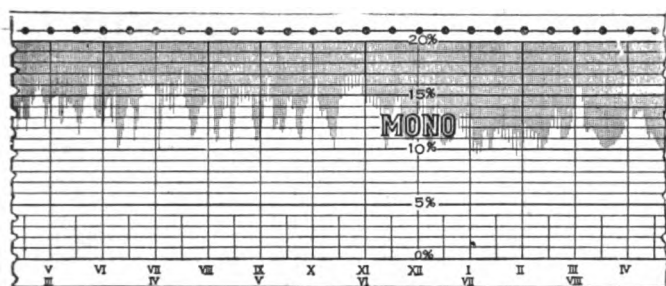


Fig. 1

the function of valves. The samples analyzed for carbon dioxide and combustible gases combined are passed through an electric furnace where the combustible gases, carbon monoxide, methane (CH_4) and hydrogen are converted into carbon dioxide and water. When there is not sufficient oxygen in the flue gases to oxidize the combustible gases, the necessary oxygen is supplied by copper oxide placed in the electric furnace for that purpose. Ordinarily, however, the necessary oxygen is taken from the flue gases, which almost invariably contain sufficient free oxygen, the copper oxide acting merely as a catalytic agent.

The carbon dioxide originally in all samples as well as that formed by the oxidation of carbon monoxide and methane (CH_4) in the alternate samples which pass through the electric furnace is removed by passing the gas through a caustic potash solution. Water formed in the electric furnace through the oxidation of hydrogen and methane in alternate samples is condensed. The analyses for carbon dioxide

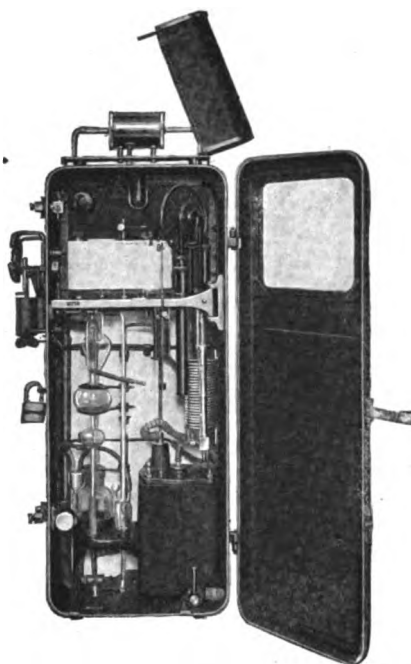


Fig. 2

alone are accurate within 1/10 of one percent. The indications for combustible gases not being intended for accurate measuring purposes are exaggerated on the chart as is desirable in a danger signal.

The records thus made by the instrument make clear to the firemen and to the plant executive the heat and combustible gas losses at any period during the operation of the boiler. No limit should be placed on how high the carbon dioxide should be kept by the fireman provided that he avoids combustible gases in the

Refrigerator and Cargo Steamer City of Pekin

Ellerman Lines' New Combination Steamer for the Eastern Trade—'Tween Deck Space Used for Refrigerated Cargoes

IN the single screw steamer *City of Pekin*, recently built by the Palmers Shipbuilding and Iron Company, Ltd., Hebburn, Eng., for the eastern trade of the Ellerman Lines, a distinctive feature is the provision made for the carriage of delicate refrigerated cargoes in Nos. 2, 3, 4 and 5 main 'tween decks. Figs. 1 and 2 show the general arrangement of the vessel which is of the two deck type with erections above the upper deck consisting of a prolonged poop and a combined bridge and forecastle with machinery located amidships. This arrangement of erections, rather than a complete shelter deck, is favored for vessels intended for the eastern trade because of the benefit derived by reduced Suez Canal tonnage measurement.

There are three cargo holds forward of the machinery space and two cargo holds and a deep tank (the latter also adaptable for cargo) aft. No. 3 hold can be employed as bunker space when so desired. The entire capacity of the erections is also available for cargo except such portions amidships as may be utilized for auxiliary bunkers. Permanent bunkers are built in the structure within the machinery space with a total capacity of 260 tons. Fuel oil is carried in the double bottom tanks.

PROPELLING MACHINERY

The propelling machinery consists of a set of turbines of the Parsons impulse reaction type driving a single screw through double reduction gearing. The turbines consist of one high pressure, one intermediate, and one low pressure geared to the propeller shaft, the high pressure and intermediate working tandem.

One high pressure astern turbine is incorporated in the intermediate pressure casing and exhausts into a low pressure astern turbine incorporated in the low pressure casing. The total astern power developed is about 70 percent of the full ahead power.

The ahead turbines are capable of developing the equivalent of 3,600 indicated horsepower at about 80 propeller revolutions per minute, at sea, under full load service conditions, but have a reserve power of 5 to 6 percent for emergency use.

The boiler installation consists of three single ended boilers of the usual cylindrical marine return tube type which are designed for a working pressure of 220 pounds per square inch. All boilers are provided with Howden's system of forced draft and are fitted with superheaters of the smoke tube type. The furnace fronts are constructed to burn oil exclusively, coal exclusively, or coal in conjunction with oil. The oil fuel installation is fitted complete in the machinery space, including the tanks, piping, pumps, heaters and filters and burners.

AUXILIARY MACHINERY

The following auxiliary machinery was furnished the vessel by the firms indicated:

Refrigerating machinery by the Liverpool Refrigeration Company, Limited.

Steam windlass and electric lighting unit by Messrs. Clark, Chapman & Company, Limited.

Steam steering gear of the Wilson-Pirie type by John Hastie & Company, Limited.

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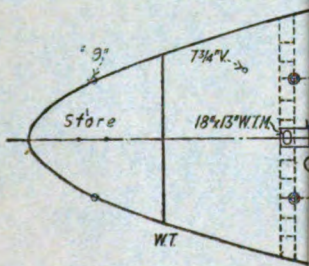
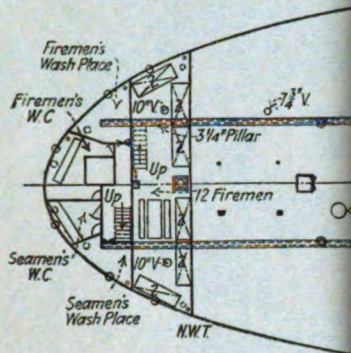
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STEAM AND CARGO MOTOR



THE
JOHN GREER
LIBRARY

City of Pekin,
Midship Section

Bridge Stringer Plate 60"x58" to 37"x36" at Ends
Butts Lapped & Treble Riveted
Poop Dk. Stringer Plate 37"x36"
Butts Lapped & Double Riveted
Poop Stringer Angle 3 1/2"x3 1/2"x36"
Bridge " " 5"x5"x64" to 3 1/2"x3 1/2"x36"

Bridge Sheerstrake 49"x78"
to 42" at Fore End of Forecastle
Butts Lapped & Quadruple Riveted
for 1/2 Length to Treble at Ends Poop
Side 40" Butts Lapped & Double Riveted.

76" to 42" in Way of Bridge and
Forecastle. Butts Quadruple Riveted
Overlaps for 1/2 Length to Treble at Ends.

Sheerstrake 49"x104" to 48" Clear
of Bridge. 76" to 48" in Way of Bridge.
Butts Double Straps, Treble Riveted
for 1/2 Length. Butts in Way of
Bridge, Quadruple Riveted to Treble at
Ends Clear of Bridge. Sheerstrake
Doubled at End of Bridge.

72"x90" to 48" at Ends Clear of Bridge
72"x76" 48" in Way of Bridge. Butts
Double Straps Treble Riveted for 1/2 L
Amidships. Butts in Way of Bridge
Quadruple Riveted. Treble
Riveted at Ends Clear of Bridge.

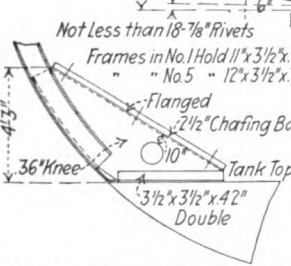
72"x76" to 54" 48" at 24" Spacing
Butts Lapped & Quadruple Rivid
for 1/2 L to Treble at Ends.

72"x76" to 54" 48" at 24" Spacing
Butts Lapped & Quadruple
Riveted for 1/2 Length to Treble
at Ends.

66"x76" to 54" 48" at 24"
Spacing. Butts Lapped &
Quadruple Riveted for 1/2 Length
to Treble at Ends.

66"x76" to 54" 48" at 24" Spacing.
Butts Lapped & Quadruple
Riveted for 1/2 Length to Treble
at Ends.

80" to 56" 48" at 24" Spacing
Butts Lapped & Quadruple
Riveted for 1/2 Length to Treble
at Ends.



SECTION IN WAY OF NOS. 1 & 5 HOLDS

Forgings

Stem bar.....11 inches by 2 1/4 inches.
Stern frame.....R. P. 9 1/2 inches by 8 1/2 inches,
P. P. 11 inches by
8 1/2 inches.
Rudder as per rule 11 1/4 inches + owners reg. =
12 inches.

Additional Scantlings (required by owners).

.02 on the bridge deck plating.
.04 on the bridge deck sheerstrake.
.04 on the bridge side plating.
.02 on the upper deck plating for full length.

BRACKET FLOORS ON ALTERNATE FRAMES

.02 on the second deck plating for full length.
.02 on the upper deck stringer for 1/2 length
amidships.
.02 on the second deck sheerstrake for 1/2 length
amidships.
.04 on the upper deck sheerstrake in way of
erection.
.10 on all the floors and intercostals and tank
top under the boilers.
.02 on the engine room and stokehold bulkheads
and these bulkheads heavily bracketed to the
decks.
Sheerstrake increased 50 percent right through
well aft.

Bridge Dk. Plating 46" for 1/2 Length to 40" at Ends
Butts Lapped & Double Riveted, Single at Ends.
Poop Dk. Plating .36" Butts Lapped & Single Riveted

Bridge Dk. Beams 9"x3 1/2"x50" B.A. on every frame 36" Spacing
forecastle " " 8 1/2"x3 1/2"x46" B.A. " " 27"
Poop " " 8"x3"x47" B.A. " " " "
" " 9 1/2"x3 1/2"x52" B.A. Alternate Frames

Stringer Plate Clear of Bridge 64"x84" for 1/2 Length to 37"x44" (Increased at Ends)
" in Way " " 64"x50" " 1/2 " " 37"x44" " of Bridge
Butts Lapped & Quadruple Riveted for 1/2 Length to Treble at Ends Clear of Bridge
" Treble " in Way of Bridge
Stringer Angles 5"x5"x72" for 1/2 Length to 4"x4"x44" Clear of Bridge
" 4"x4"x50" to 44" in Way of Bridge

3 1/2"x3 1/2"x50" to 44"

Beam Knees 26"x48"
6-7/8" Rivets

6" in Way of Bridge
6 3/4" Clear

Mainframes run to Upper Deck in B. Space
Frames 76-81 Inclusive
Stringer Plate Clear of Bridge 49"x50" for 1/2 L to 37"x44"
" in Way " " 49"x44" " 1/2 " " 37"x44"
Butt Lapped and Treble Riveted
Stringer Angle 4"x4"x50" to 44"

3 1/2"x3 1/2"x50" to 44"

Beam Knees
42"x30"x50"

7-7/8" Rivets
Flanged on Face

Beams 11"x3 1/2"x56" B.A. on every frame at 36" Spacing
" 12"x3 1/2"x74" B.A. - Alternate Frames at 27" Spacing.
No Increase on Hatch End Beams

Side Frames 12"x3 1/2"x70" B.A. to Second Dk. at 36" Spacing
" " 11"x3 1/2"x60" B.A. " " 27"
" " 8 1/2"x3 1/2"x54" B.A. to Tween Dks. scarphed to Main Frames
" " 8"x3 1/2"x46" B.A. to Peaks, Spaced 24" Apart.

Side Stringer in No 5 Hold Intercostal Plate 15 1/2"x44"
Flanged to Shell Face Angles 7"x3 1/2"x52"

Margin Plate 43"x50" 58" in B.S.
Butts Lapped and Treble Riveted
Outside Vertical Angles 5"x5"x58" to 54" all F & A. 64" in B.S.
Inside " " 5"x3 1/2"x44" to 42" all F & A. 52" in B.S.

8"x2 1/2" WW
Flanged Bkt. 47" for 1/2 L to 38"
at Ends. 52" in B.S.

Air Space
Plate Gusset on every
Frame

Frames 3 1/2"x3 1/2"x44" to 42" Double
from 3 1/2" L to Collision Bulkhd.

Floors & Intercostals 42" for 1/2 L to 38" 52" in B.S.
Doubling Plate under Pillars. 3 1/2"x3 1/2"x44" to 42" 54" in B.S.
12" Rivets.

Reverse Bar 3 1/2"x3 1/2"x44" to 42"
54" in B. Space Double in E.
Space, under Boiler Bearers

Tank Top in Way of Hatches
Increased .08" in Lieu of Ceiling.
Tank Top Plating 48" for 1/2 L
to 44" in 36" Spacing. 44" in 27"
Spacing. 56" in E.S. 8.58" in B.S.
Butts Lapped & Double Riveted.
Tank Top carried to Ships Side
in Nos. 1 & 5 Holds. No Manholes
to be punched in Floor or
Intercostal under Pillar.

Tank Top Increased .08" in Way
of Oil Fuel Tanks.
Edge Laps Double Riveted.

Tank Top Centre Strake
46"x54" for 1/2 Length to 44" at Ends. 58"
in B.S. Butts Lapped & Treble Rivid. for
1/2 Length Double at Ends.

5"x5"x60" to 54" Single
3 1/2"x3 1/2"x54" Double in E.S. & forward of 3 1/2"
3 1/2"x3 1/2"x70" " " B.S.

Centre Girder 46"x56" for 1/2 L
to 46" at Ends. 62" in B.S. Butts
Overlapped & Treble Riveted
5"x5"x60" Single. 70" in B.S.
3 1/2"x3 1/2"x42" at Ends

Keel Angles 5"x5"x60" to 56" at Ends
Flat Plate Keel 49"x112" for 3 1/2" L to .78"
Double Straps Treble Riveted

1/2 Height Intercostal from 3 1/2" Length
forward carried as far forward as
practicable.

46" to 42"
56" in B.S.

9"x3"x46" B.A. Brackets in Way of Pillars
46" to 42"
56" in B.S.

9"x3 1/2"x48" B.A. 58" in B.S.

Fig. 3.—S. S. City of Pekin, Midship Section

The following strengthening to be added to
the vessel for Atlantic work:

.04 on shell plating from keel to 1 foot 6
inches above top stringer and from frame
129 to stem.

Deep knees to lower tier of beams in fore peak.
No reduction in main frames in No. 1 hold.
Frames in fore peak increased .04 inch in thick-
ness.

Floors increased in depth in fore peak.
Frame bottoms doubled from frame 122 to col-
lision bulkhead.

Stringer increased 1 inch from frame 119 to
collision bulkhead.

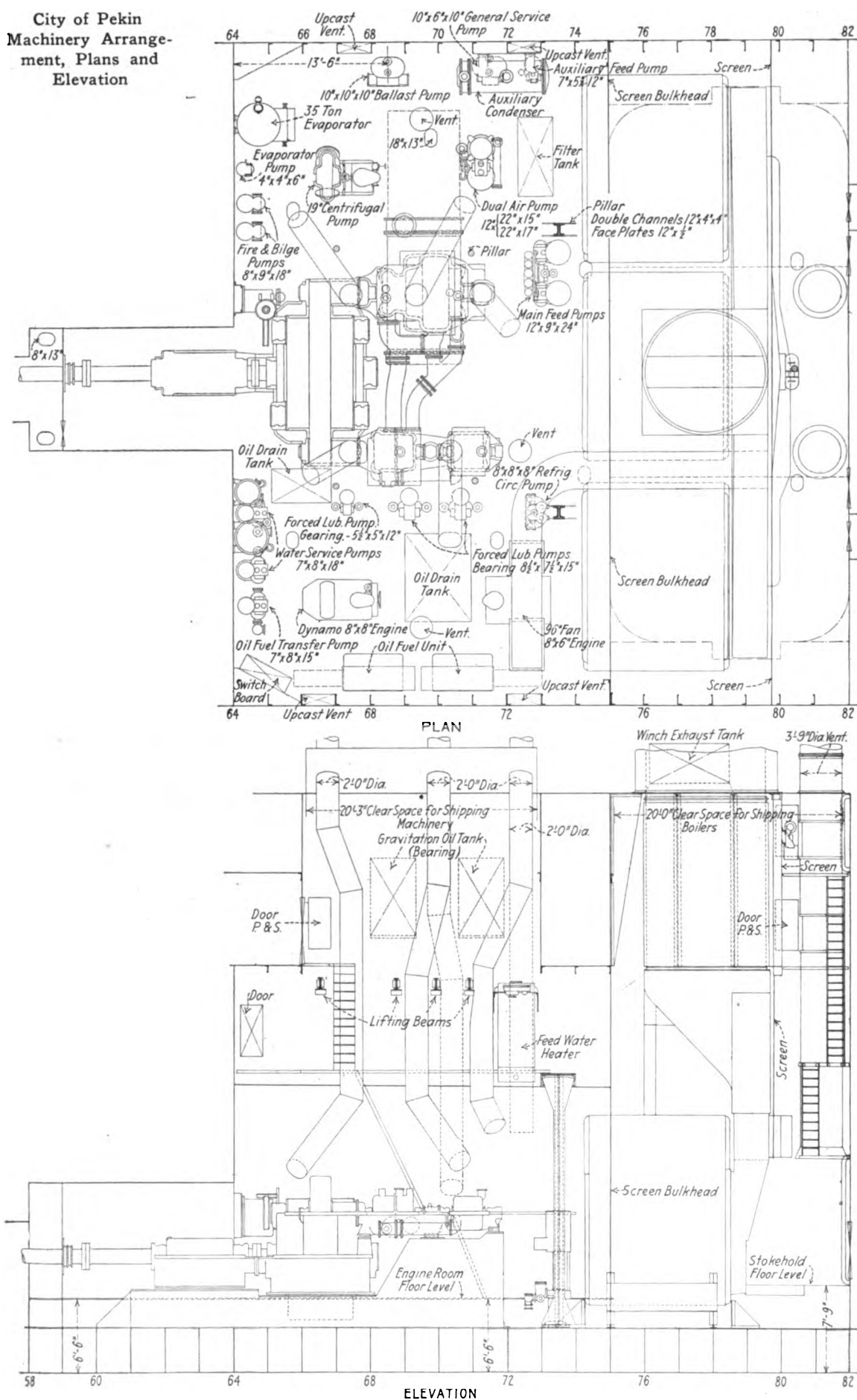
City of Pekin
Machinery Arrange-
ment, Plans and
Elevation

Fig. 4.—S. S. City of Pekin: Plan and Elevation of Engine and Boiler Rooms

Naval Architects' Annual Meeting

THE twenty-ninth general meeting of the Society of Naval Architects and Marine Engineers will be held in Assembly Room No. 1 of the Engineering Societies Building, 29 West 39th street, New York, on Thursday and Friday, November 17 and 18, 1921. The annual banquet will be held in the Grand Ball Room, Waldorf-Astoria Hotel, New York, on Friday evening, November 18.

During the meeting the second session on Thursday, November 17, from 2 to 5 P. M., will be set aside for the purpose of holding a joint meeting with the American Institute of Electrical Engineers at which two papers will be presented, one devoted to electrical propulsion and the other to electrical auxiliaries.

During the week of November 14, coincident with the meeting of the Naval Architects' Society, the first annual exhibit of the Marine Equipment Association will be held in the Central Mercantile Building, Sixth avenue, 18th to 19th streets, New York city, and it is the intention to reserve certain hours each day for members of the society and others intimately interested in the exhibits to attend the exposition.

COMPUTERS WANTED. — The United States Civil Service Commission announces an open competitive examination for computer on September 21 to 22 and November 2 to 3, 1921. Vacancies in the Coast and Geodetic Survey for duty in Washington, D. C., at \$1,400 a year and for duty in the Manila, P. I., office at \$2,000 a year, and vacancies in positions requiring similar qualifications at these or higher or lower salaries will be filled from this examination unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer or promotion.

CORRECTION.—In the article entitled "Are You a Marine Engineer, Edison Standard," published on page 588 of the August issue, question No. 65 should have read "Why Should Not Alternating Current Be Used for the Lighting Set on an Electrically Driven Ship?"

COMMANDER V. V. WOODWARD, U. S. N., has resigned as manager of the repair department of the United States Shipping Board and will return to active service in the United States Navy.

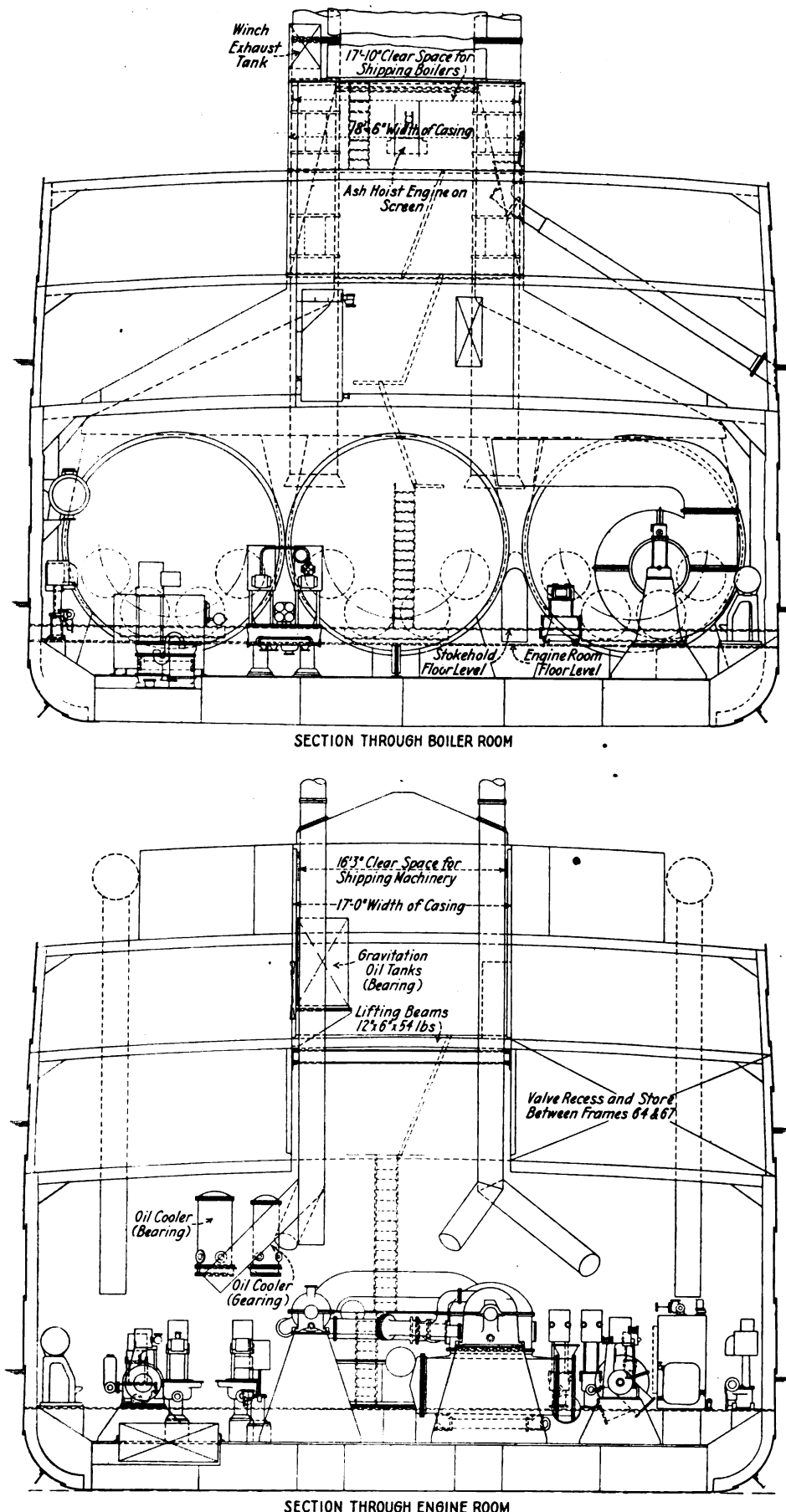


Fig. 5.—S. S. City of Pekin: Sections Through Boiler and Engine Rooms

The Americanization of Our Merchant Marine

By "Old Scotch"

Louis the Sixteenth of France depended upon his Swiss Guards to protect him. We all know that Louis eventually had his head chopped off. Great Britain depended largely upon her Hessian hirelings to subjugate her colonies during our War of the Revolution. We know what happened to the Hessians. Both of these matters of history tend to prove that when you have a national job to attend to you ought to employ your own people, if you want it done right.

SHIPPING on the seven seas is just as much a national job as fighting, hence if we are going to depend on hirelings from other nations to run our merchant marine we will get what happened to King Louis and King George, not to mention numerous other potentates in the world's history, who placed too much dependence on foreign help. And we will deserve it.

In our merchant marine development we have reached a point where there must be a "show down" to use a popular phrase familiar, I feel sure, to some of our readers. Up to this time we have operated our ships like a meeting of the League of Nations. Most of them, it is true, have had American captains and chief engineers, but the remainder of the officers and the crews have been drawn from the "57 varieties" of seafaring men which inhabit the world at large. They have been attracted to our ships by the best wages and best grub found anywhere afloat. I don't blame them for coming and I have no criticism to make of them, except for the fact that they have not appreciated what easy berths they have had.

ALIEN CREWS MUST GO

The time has now arrived for them to go home, except those few who are sincerely anxious to become American citizens and adopt our flag as their own and who have not only declared their intention by taking our first papers but who by their actions and habits have demonstrated that they can and will become desirable additions to our population. All "red ink" men and other seafarers, who are at heart merely professing Americanism for revenue only, had better take their hats and go, as from now on we will have enough genuine Americans to man all our own ships.

Just at present there are not many operating ships to man, hence the greater reason for giving our own seafaring men all the ship jobs we have, as there are today hundreds and even thousands of good, competent Americans walking the streets of our seaports, while many of our ships are sailing with aliens in their crews.

COMPETENT AMERICAN CREWS ARE AVAILABLE

The new Shipping Board has thus far functioned most acceptably. Their appointments have been fine and their actions have rung with the right tone. To a man they seem imbued with the American spirit of making our shipping efforts a success. The time is now most propitious, when there are so few ships operating and so many men looking for jobs, to come out with a cast iron resolution that from now on every man from the captain down to the lowest ratings among the seamen and firemen must be American citizens on every ship owned wholly, or in part, by the United States Government. The private shipowners can be depended upon to follow suit, as it will be demonstrated that American ships operated entirely by American citizens will be much more profitable than the same ships manned by crews who have no interest in their jobs other than to get all out of them they can for their personal gain in wages and comfort.

It is nonsense to say that there are not enough Americans

to man all our ships, both of public and private ownership. There are probably two hundred thousand young Americans today who were trained at sea during the war both on naval and merchant vessels. Over one hundred and fifty thousand men have been discharged from our shipyards during the last year. At least one-third of these men could fill jobs aboard ship very acceptably, especially in the engine room force. With the tonnage we are now operating, it is probable that not over fifty thousand officers and men are necessary for the entire fleet. Therefore at this time we not only can have enough Americans for every job at sea, but our shipping directors can pick and choose and secure only the most competent for the available billets.

A SAMPLE OF PRESENT CONDITIONS

To best illustrate the way some of our ships are being run right now, I have only to quote from a letter received today from a young third mate on an American owned and American built steamer of 12,000 tons deadweight.

* * * "Here are just a few things, 'Packet.' To begin with the wireless operator and myself are the only Americans (real ones) on the d—n ship. The captain may be, but he doesn't act like one. The chief engineer is Irish, the first assistant engineer a German, the second assistant engineer is Danish. The chief officer is Danish, the second officer is Norwegian and the third officer, your humble servant, a genuine American. In the fireroom of course only Spaniards, Greeks and Italians. The whole steward's department is half white mongrel West Indians, the worst in the world. The whole deck crew are a mixed lot, with even two darkeys for sailors. Already the first assistant engineer (German) has had a fist fight with the second assistant (English). The Danish chief officer has no use for the second officer (Norwegian), etc., and thus it goes."

What a commentary on the American merchant marine! And this ship belongs to an old-established American shipping firm at that. How can we expect to run ships with a bunch of marine highbinders such as this young man has described? What a degrading influence for young American officers and seamen to be thrown into contact with such disturbing elements! It is time to call a halt on all such floating congresses of nations as this one, sailing around under the American flag. If we cannot get American citizens to officer and man our ships, let's quit the seas and acknowledge to the world our incompetency!

But it can be done, as I have already pointed out. The men are available and willing and we have the ships to man. All it needs is a determined effort on the part of the Shipping Board and I, for one, feel confident that the present membership has the nerve and resolution to put a stop to this alien domination of our merchant ships.

THE SOURCE OF TROUBLE

It's a safe bet that nine-tenths of all the strikes, Bolshevistic uprisings, near mutinies, yes, and sabotage, with which our American operated ships have been cursed within the past three or four years, are directly due to the bunch of marine nondescripts of all nations which have been hired as crews. Much of it is traceable to the internationalism of certain unions, in which Americans have no control. It is

very refreshing to learn that a real American seamen's union has recently been formed and it is hoped that both the Government and the private shipowners will do their best to encourage such an organization.

ONE HUNDRED PERCENT AMERICAN SHIPPING

No ship, hereafter, which belongs to the United States Government should be allowed to sail unless she has a 100 percent crew of American citizens. In every chartered ship controlled by the Shipping Board a clause should be put in the charter requiring the operator to employ none but citizens of the United States, or those who have declared their intentions of becoming citizens and who, by their demeanor, prove that they expect to live up to their intentions and will make worthy citizens.

We should go further than having the ships manned by

Americans and require that every representative of the Shipping Board abroad, and at home, too, for that matter, should be a citizen both legally and in spirit. Secretary Hoover, of the Department of Commerce, recently said, in a public address, that we will never extend our foreign commerce unless we have our own nationals to transact our business abroad. Every other nation which has obtained any success in foreign commerce has built up its trade by having its own citizens at every point to transact its business.

Shall we be guided by the lessons of history and by the examples of successful competitors? Or shall we stumble along in this blind and irrational way we are now operating our ships? Gentlemen of the Shipping Board, it is up to you to take the initiative in this most vital matter of Americanizing our merchant marine and to do it quickly. Make our merchant marine one hundred percent American!

Encouragement of American Marine Insurance

Chief of New Governmental Activities That Have Contact with Shipping and Shipbuilding

By Waldon Fawcett

WITH the reorganized Shipping Board given a free hand to work out its own salvation, the Congress of the United States is turning to some of the more important problems, incident to the upbuilding of an American merchant marine that were left for future consideration when the Merchant Marine Act of 1920 was enacted. It is surprising how many supplementary issues thus await attention, ranging all the way from the load line proposition to the project to allow passage through the Panama Canal, without payment of tolls, of American vessels engaged in the coastwise trade.

Perhaps the most important, however, of all waiting responsibilities is that which involves encouragement for the development in the United States of resources adequate to provide marine insurance for the American fleet. This is a need which has been recognized since the inception of the program which resulted in enactment of the Merchant Marine Act. The first thought was to provide in that general bill for the necessities in insurance facilities upon which in a measure will wait the progress of the American merchant marine. Upon investigation it was disclosed, however, that the remedy for the shortcomings of marine insurance facilities in this country must be found not in national legislation but in legislation by the various States of the Union, with the object of rendering uniformly favorable the conditions under which marine underwriting may be carried on.

MODEL INSURANCE BILL

With the recognition that it rests with the States to encourage support for marine insurance, there has been realization on the part of the friends of the merchant marine that it would speed the movement, if there were some way in which Congress could take the initiative. Out of this desire to have the national legislature point the way has grown the legislative measure that is now pending in both Senate and House of Representatives, having been favorably reported during the past month. This takes the form of a bill to regulate marine insurance in the District of Columbia. In the District of Columbia, Congress exercises the functions of a State legislature. Hence the proposal for the enactment for this jurisdiction of a marine insurance act, which should serve as a model statute for all the States and an object lesson in effective procedure.

The marine insurance bill (designated officially S. 2265 or H. R. 6775) was introduced in the House of Representatives in June and in the Senate in July, being promptly reported favorably, with recommendation for passage, by the respective committees to which it was referred. In reporting the bill to the Senate, the latter part of July, Senator Jones, as chairman of the Committee on Commerce, remarked that it will probably be necessary to use "heroic" measures to build up an American merchant marine. One of the most important factors, he believes, in the maintenance of a merchant marine and the development of foreign commerce is marine insurance.

INSURANCE A BIG FACTOR

It was his observation that the nation whose citizens control marine insurance largely controls the world's marine and trade. This he attributed to the circumstance that the men and companies who do marine insurance learn the business methods and trade secrets of marine and commercial competitors and they do this without disclosing anything of the practices or secrets of their own allied marine and commercial interests. Emphasis was laid on the fact that more than two-thirds of the insurance on American ships and cargoes is done by foreigners. More than three-fourths of American hull insurance is done by foreigners. This should not be, declared Senator Jones, especially now when the United States has so large a tonnage that it hopes to have operated profitably in the foreign trade.

In urging upon his fellow legislators the enactment without delay of the pending measure, the chairman of the Senate Committee on Commerce declared that one of the great handicaps to the growth of American marine insurance is the diversity of American laws affecting it. Legislative jurisdiction over this subject rests with the various States and there is no uniformity in their legislation. Little account seems to have been taken by the respective States of the broad interests of the nation. Not only have no efforts been made to aid in building up marine insurance but many States have provisions of law that are actual handicaps to such development.

NATION'S INTEREST SHOWN

The deliberately considered and carefully drafted marine insurance bill which Congress is expected to make effective

in the District of Columbia is an attempt to show the nation's interest in this subject and to suggest model legislation, which it is hoped will be followed by the various States. The prospective statute takes a nation's view of the marine insurance problem, but always with due regard for local interests. It is an expression by the general government of what is needed to serve a national purpose, and it only remains for the various States to follow it as closely as may be in order to lay the foundation for an adequate marine insurance structure. While marine insurance companies will doubtless be organized forthwith in the District of Columbia in order to take advantage of the opportunities offered, the arrival of the millennium in American marine insurance conditions must, perforce, wait upon the enactment of sympathetic legislation in the various States of the Union.

This formal solution for the marine insurance problem, which now awaits the O. K. of Congress, is the product of a special investigation by Congressional committees which has extended over a period of two years. Incident to this survey experts were employed to study the question in all its aspects. Summarizing the result of such research, Dr. S. S. Huebner, the insurance expert, recently reported to Congress that about one-half of all the reinsurance placed by American companies is placed with foreign underwriters. A great majority of the American underwriters informed the investigators that this was not due to choice but to necessity. Facilities have been so limited that an American company which could only accept a reasonable amount of insurance on a particular risk has been obliged to resort to the foreign markets in order to place the insurance offered to it.

INSURANCE EXPORTED DIRECTLY TO FOREIGN MARKETS

Stressing the moral, already pointed, the investigation also developed the fact that a very large proportion of the marine insurance originating in the United States has been exported directly to the foreign markets. That is to say it was placed with alien underwriters who did not even have a branch office in this country—were not "admitted companies." Dr. Huebner remarked that it was hard to say just how much insurance is exported in this way, but, through correspondence, he developed the fact that as regards 67 non-admitted alien underwriters this country sent out \$12,000,000 in premiums for the year 1918. This excluded all the insurance placed with Lloyd's and many other sources which the experts did not discover. All told, two-thirds of all American marine insurance originating in this country was found to be under foreign control during the period covered by the Congressional investigation. A circumstance not to be overlooked in this same connection is that exported insurance pays no taxes whatever to this country.

MENACE TO COMMERCIAL SECRETS

Louder even than the alarm in the Senate is that which has been sounded in the House of Representatives. In reporting the marine insurance bill, Congressman Focht of the Committee on the District of Columbia proclaimed the danger of allowing marine insurance originating in the United States to be under foreign domination. In his belief no other strategic branch of American commerce has been handed over so completely to the control of foreign interests. He also took cognizance of the fact that the bulk of the business transacted by American companies has been written by a very few. Two companies received nearly one-fourth of the total net marine premium income and ten companies received approximately two-thirds of such income. While American companies placed one-half of their reinsurance with foreign underwriters, the reinsurance placed by foreign underwriters with American companies was only about one-half the reinsurance that went from the United States to interests overseas. Moreover, American companies have never been able thus far to enter the foreign field to any appreciable extent, and

in many important commercial countries not a single branch of an American insurance company may be found.

In declaring the need for an ample and independent American marine insurance institution, the summons to action, that has recently been served on the House of Representatives, declares that nations that are strong in marine-insurance facilities may deny the service altogether or give it only under unfavorable conditions to the citizens of other nations which do not possess adequate facilities of their own. The menace to commercial secrets is proclaimed just as it has been by the Commerce Committee of the Senate. It is pointed out that foreign underwriters, when insuring American cargoes, necessarily learn the facts concerning the carriers used, the consignees, methods of packing and handling, financial affiliations of the consignors, costs of production and the conditions and price of sales.

The current effort to bring about, State by State, removal of the legislative obstacles which unnecessarily restrict the underwriting activities of American companies constitutes but half of a two-part program for fostering American marine insurance. Quite as serious as the State laws, which operate to make it impossible for American underwriters to meet foreign rates, has been the failure, in the past, of American companies to cooperate in the interest of economy and efficiency, as have their foreign competitors. It is difficult to say which of these two elements constitutes the most formidable factor.

AMERICAN MARINE INSURANCE SYNDICATES

Lack of cooperation or team play in marine insurance activities is, however, in a fair way to removal, thanks to Congress and the Shipping Board, through the creation of the American Marine Insurance Syndicates, known as Syndicates A, B and C. Syndicate A is a purely service syndicate and represents a salvage association which will work hand in hand for the development of the market through the medium of the two underwriting syndicates (Syndicates B and C) and will be to the American shipping trade and to the American marine insurance market what the London Salvage Association is to the British shipping trade and the British marine insurance market. All of the syndicates are now fully organized and functioning and are enlarging the scope of their usefulness.

Through these syndicates, as their work has lately been pictured to Congress, a total of \$2,500,000 may be bound promptly through a central office on a single vessel, each of the fifty member companies taking its allotted share of the total risk. Instead of the broker having to interview some fifty underwriting offices, as in the past, his work is now concentrated at one office at a big saving of time and expense. One policy takes the place of fifty or one hundred policies on a single risk. In the same way, losses are settled through a central office by one check instead of the previous method of applying to each company for its share of the claim. Adjustment of losses will also be handled jointly at a great saving in time and expense instead of having numerous companies represented by their individual adjusters.

MAKING COMMON CAUSE

Far from constituting a radical innovation, this new plan of cooperation simply represents the application to American marine insurance of principles which foreign competitors have followed advantageously for many years. It is by just such methods of cooperation that British companies have not only enlarged their underwriting capacity and strengthened their financial standing but have greatly reduced their overhead charges. By making common cause they have been enabled to give adequate service, to eliminate irritating jealousies, and to act, whenever an international competitive situation presents itself, as one united force capable of pursuing an intelligent policy. Syndicate arrangements, as lately

perfected in the United States, assure greater convenience and speed in the handling of large lines of insurance and facilitate the spread of large risks, thus fulfilling the function of automatic reinsurance.

With cooperative effort through syndicate arrangements an assured success, Congress and the country will be found ready, it is believed, to concentrate on the other half of the problem—elimination of legislative restrictions. The glaring deficiencies of present State statutes arise from the fact that these are provincial in character and in nearly all instances were designed with special reference to fire insurance, with-

out recognition of the vital differences between fire and marine insurance. The hampering State laws are not adapted to the regulation of a business which vitally affects the commerce of the nation and which, unlike fire insurance, is essentially international in character and subject at all times to the keenest foreign competition. But by reason of decisions of the United States Supreme Courts which confirm the several States in complete supervisory control over insurance, no other method of procedure is possible than that whereby Congress undertakes to give a cue to the States, via a Congressional expression, on what is really a national measure.

Steam Trawler Rudyard Kipling

Some idea of the importance of the fishing industry to the United States may be gained by the following information. There are in the neighborhood of 200,000 persons and 7,500 vessels engaged in our fisheries. The capital invested amounts to \$175,000,000 and the annual production of fishery products is approximately two and a half billion pounds, valued at about \$85,000,000 to the fishermen. Among the more important class of fishing vessels, both in England and America, is the steam trawler and a modern type of English practice is presented in the "Rudyard Kipling."

THE *Rudyard Kipling*, recently constructed in the yard of Messrs. Cochrane & Sons, Ltd., Selby, Yorkshire, England, was built to the account of the Newington Steam Trawler Company, Ltd., of Hull, England. She is a first-class steam trawler designed for service in the waters about Iceland and is classed 100 A-1 by Lloyd's for fishing purposes. The principal dimensions of the vessel are as follows:

Length	138 feet 4 inches
Breadth, extreme.....	23 feet 9 inches
Depth, molded.....	13 feet 6 inches
Speed	11 knots

HULL

The hull is arranged with holds in which the fish may be stowed and is also fitted with stowage places or ponds on deck. The vessel's main and spare fish rooms, comprising the holds forward, are insulated on the sides and after bulkhead with Mackays Noel insulation.

A powerful steam winch is located amidships and a steam windlass forward.

Accommodations for the crew are provided forward; the officers are berthed aft.

MACHINERY

The main propelling machinery consists of one triple expansion engine having cylinders 13 inches, 23 inches and 37 inches in diameter by 26 inches stroke. The high pressure and intermediate pressure valves are of the piston type, the low pressure valve being of the "D" type.

The condenser, which is a separate casting, is carried by brackets on engine columns.

BOILERS

One large cylindrical boiler is fitted, having an internal diameter of 14 feet and a length of 10 feet 8 inches. It is designed to work under a pressure of 200 pounds per square inch. Three plain furnaces of the Gourley withdrawable type are provided.

The vessel is fitted throughout with electric light.

The *Rudyard Kipling* will be commanded by Skipper William Addy, formerly of the trawler *Conan Doyle*.

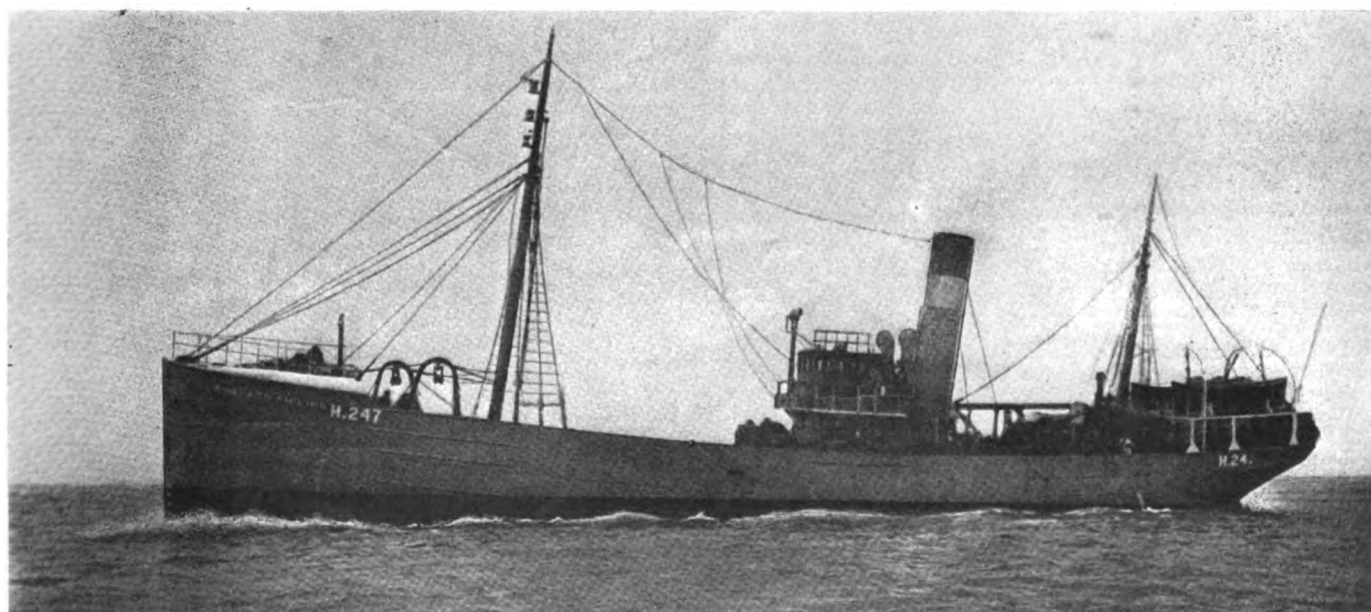


Fig. 1.—Steam Trawler Rudyard Kipling, Built by Messrs. Cochrane & Sons, for Newington Steam Trawler Company

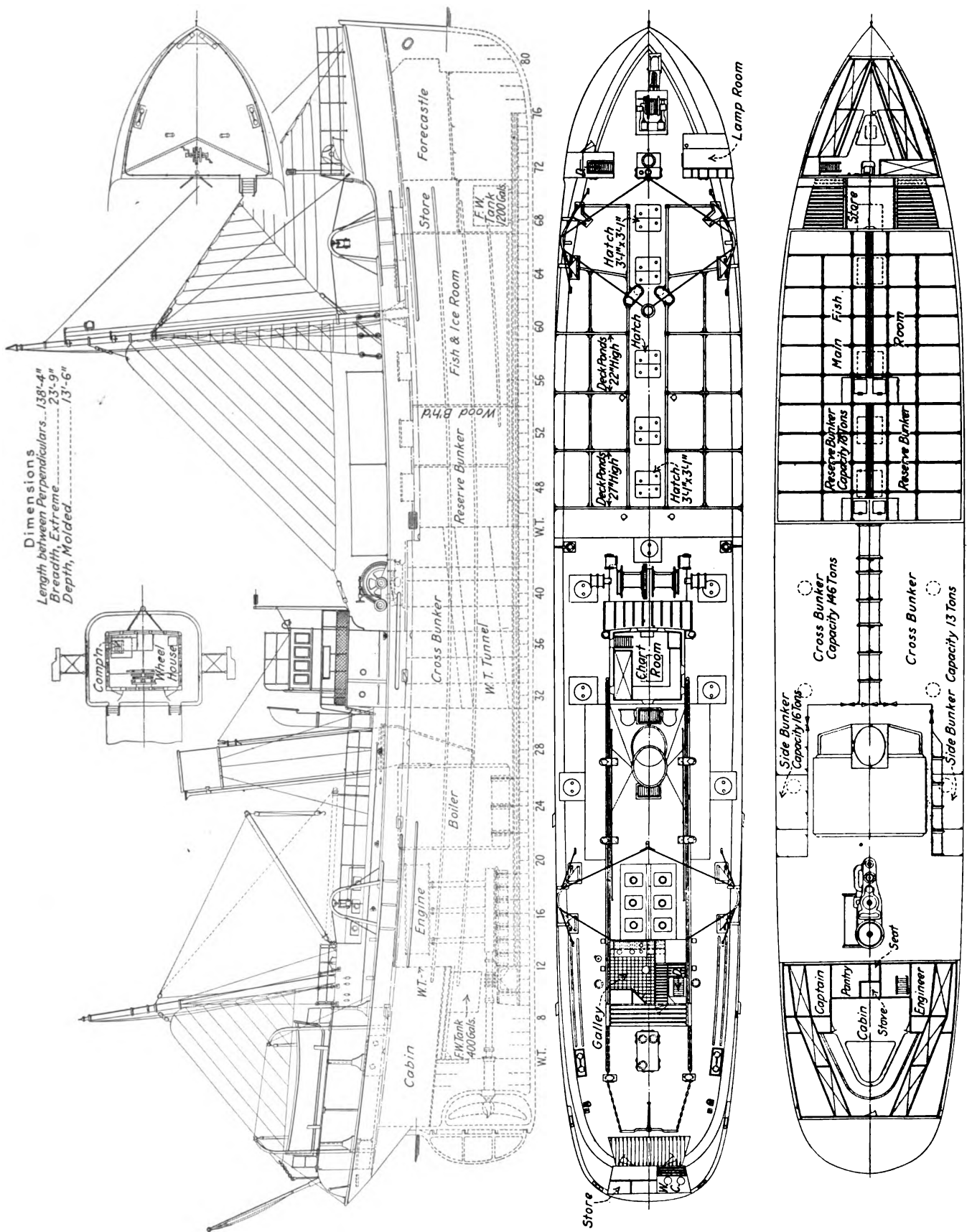
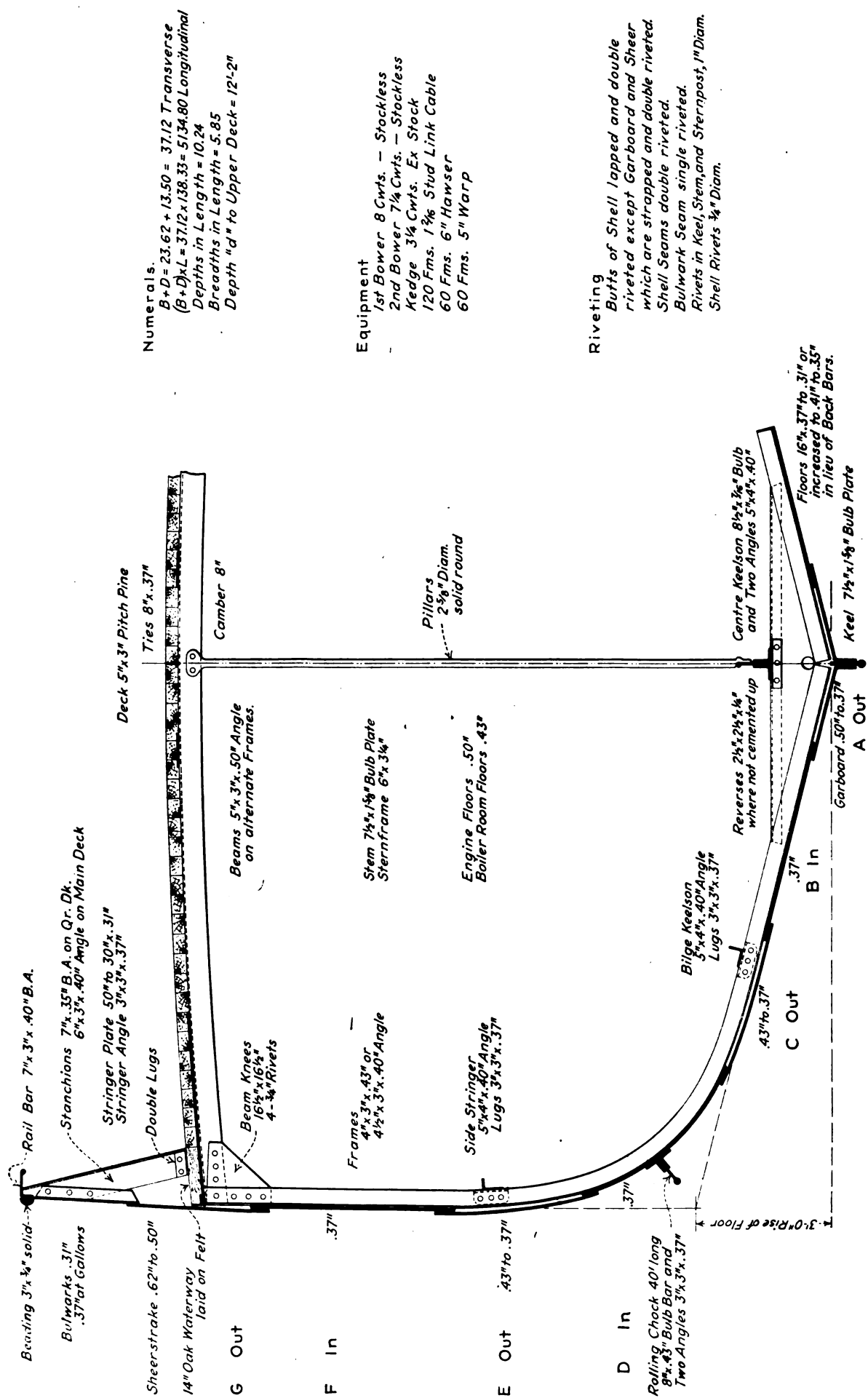


Fig. 2.—General Arrangement, S. S. Rudyard Kipling



Numerals.

$B+D = 23.62 + 13.50 = 37.12$ Transverse
 $(B+D) \times L = 37.12 \times 138.33 = 5134.80$ Longitudinal
 Depths in Length = 10.24
 Breadths in Length = 5.85
 Depth "d" to Upper Deck = 12'-2"

Equipment

1st Bower 8 Cwts. — Stockless
 2nd Bower 7 1/4 Cwts. — Stockless
 Hedge 3 1/4 Cwts. Ex Stock
 120 Fms. 1 3/8" Stud Link Cable
 60 Fms. 6" Hawser
 60 Fms. 5" Warp

Riveting

Butts of Shell lapped and double
 riveted except Garboard and Sheer
 which are strapped and double riveted.
 Shell Seams double riveted.
 Bulwark Seam single riveted.
 Rivets in Keel, Stem, and Sternpost, 1" Diam.
 Shell Rivets 3/4" Diam.

Fig. 3.—Midship Section, S. S. Rudyard Kipling



S. S. Paris Starting on Trial Trip at Base des Glenans on June 5, 1921; Average Speed on Trials, 22.4 Knots

New French Passenger and Mail Liner Paris

**Largest and Most Luxurious Vessel Ever Constructed
in France to Ply Between New York and Havre**

ALTHOUGH not so large as the *Olympic* or *Imperator* and not intended to challenge the speed record of the *Mauretania*, the *Paris*, operated by the Cie Generale Transatlantique, is one of the finest liners put into service in recent years. The opinion of those who have seen the *Paris* is that she has established a record for luxury and good taste in steamship accommodations that will not be equalled for many years.

After the *Olympic* had been converted to an oil burner Lord Pirrie on the trial trip referred to that vessel as the one "ewe lamb" of the White Star fleet. This saying has been interpreted to mean that there was little likelihood in the near future of the construction of new giant fast liners of the *Olympic* type because of the high cost of building and the excessive consumption of fuel for the few extra knots of speed. On this account the Cie Generale Transatlantique is to be congratulated for its business acumen in sparing no expense to make the *Paris* the most elaborately equipped vessel in the transatlantic service.

STARTED IN 1913

The *Paris* was laid down in 1913 and was to have been ready for service in 1916. The great war, however, interrupted the work so that she was not launched until September 12, 1916. Shortly after the armistice, work was resumed and on June 15 of the present year the vessel sailed from Havre for New York on her maiden voyage.

The *Paris* was constructed at the Chantiers et Ateliers de Penhoët à St. Nazaire. She is designed to satisfy the requirements of the International Convention for the Safety of Life at Sea and the American and French shipping laws. She is constructed to have the highest rating of the Bureau de Veritas with the mark of special surveillance.

GENERAL ARRANGEMENT

The *Paris* is a vessel with a straight stem, elliptical stern, two pole masts and three funnels.

The accommodations are distributed over five decks and there are five holds, two forward, which are used exclusively for passengers' luggage, and three aft, in which are carried mail and other cargo.

A special feature of this liner is that it is furnished in modern French style, in this respect differing from most other

ships which have adopted a Renaissance period for their decorative scheme.

The main saloon, located on B deck forward, is 84 feet long, 50 feet wide and 24 feet high. A mixed saloon, of about the same dimensions, is located on B deck abaft the main saloon; between the two is the main stairway and foyer. Smoking rooms are provided aft of the mixed saloon and occupy spaces on both B and C decks. The first class dining saloon is amidships on E deck and extends also to a balcony on D deck. A dining saloon for the second class is located on E deck aft. On C deck amidships is located the grand social hall and information bureau.

There are 141 first-class cabins with single berth accommodations, 163 with double and 32 which may be comfortably occupied by three persons. Included in the total number of first-class accommodations are 89 luxurious suites with boudoirs, drawing rooms and private bath.

The second-class cabin of the *Paris*, which accommodates 468 passengers, is proportionately luxurious in every way.

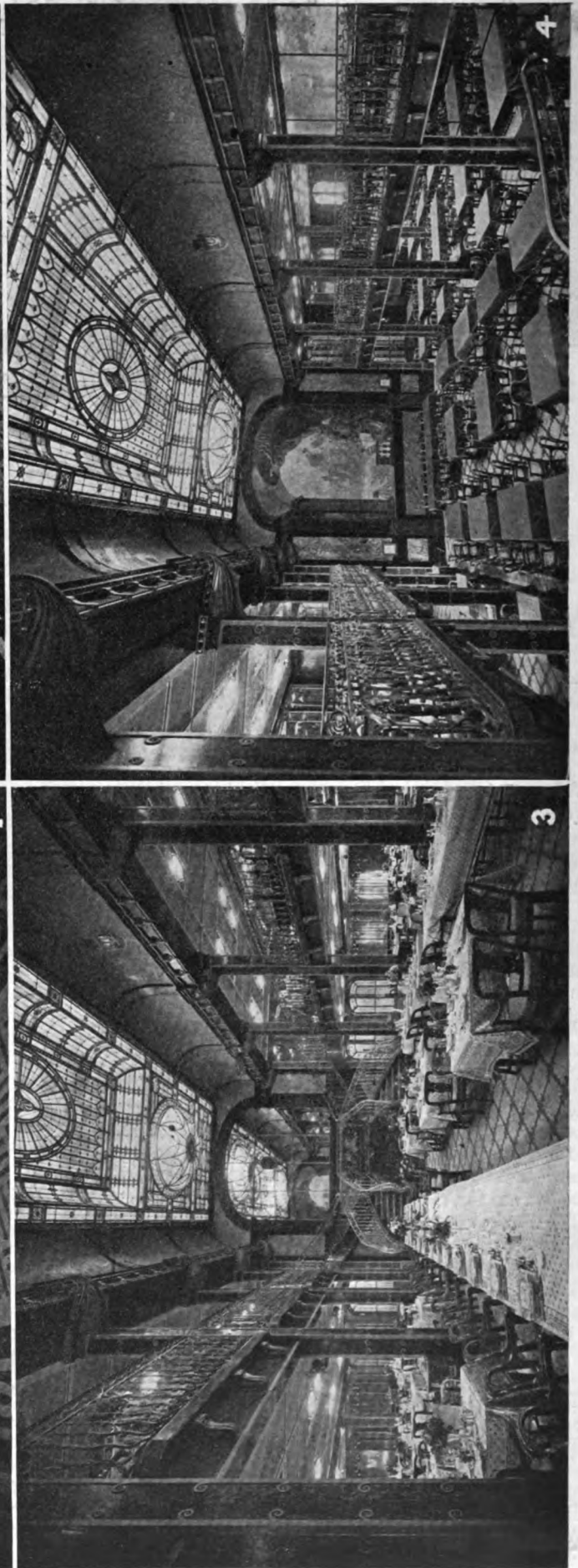
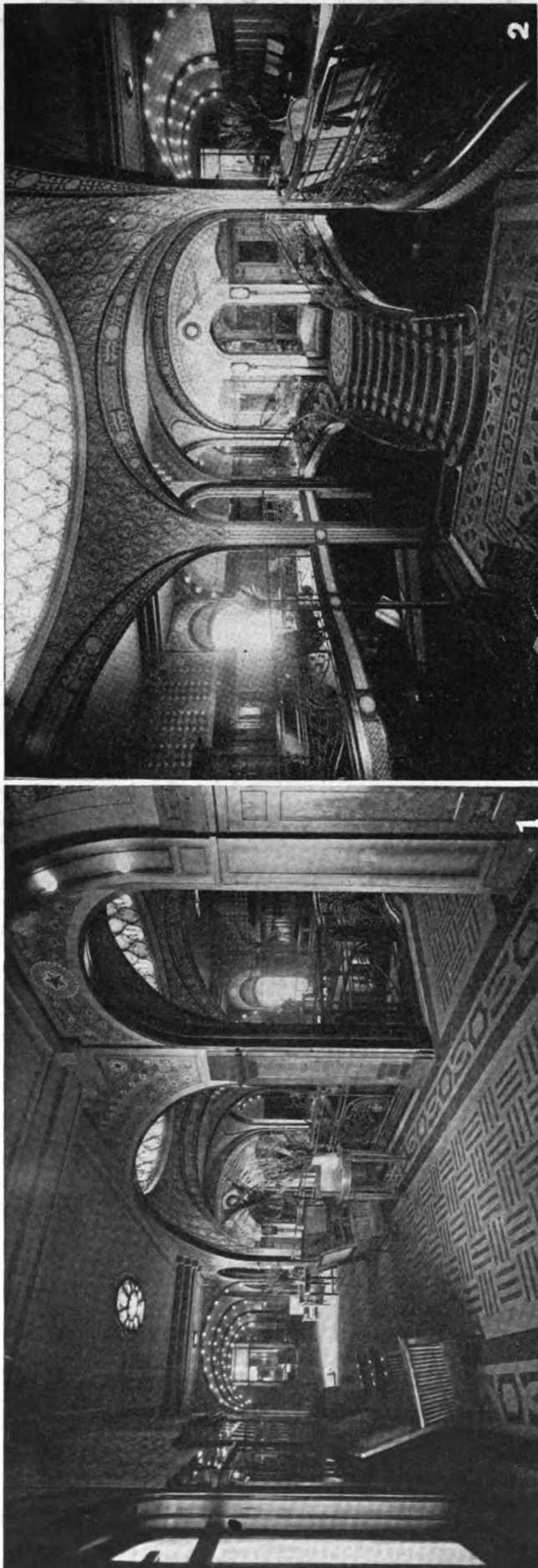
Provision is made for the accommodation of 1,100 third-class passengers in cabins and 1,110 steerage in open berths.

MAIN PROPELLING MACHINERY

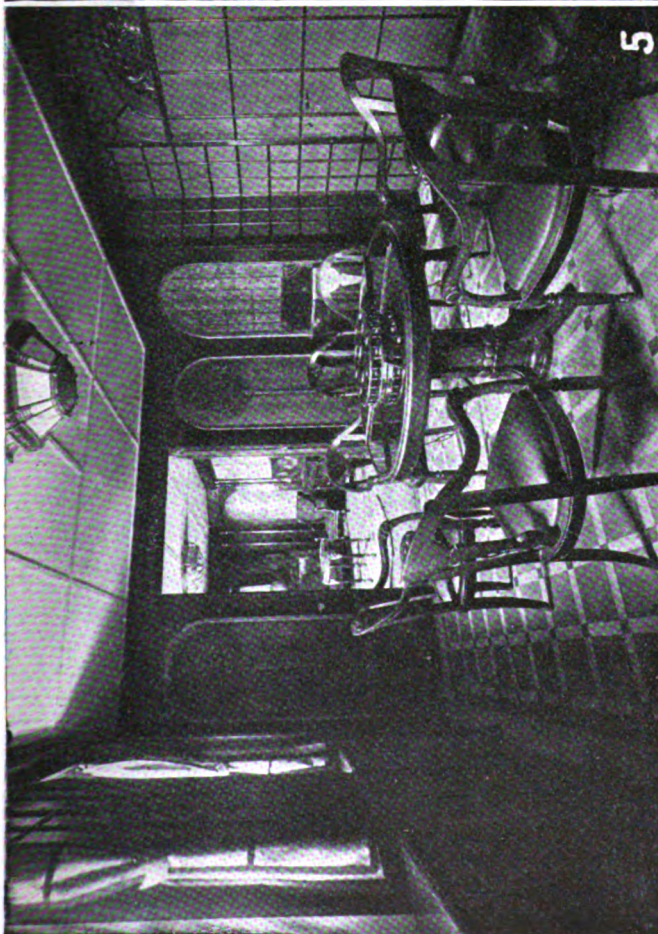
The propelling machinery was built by the Wallsend Slipway & Engineering Company, Ltd., at Wallsend-on-Tyne, and consists of four turbines of the Parsons type. Two low pressure turbines are flanked by one medium pressure on the starboard side and one high pressure on the port side. For maneuvering purposes there is a mechanism on board which makes independent the starboard and port engines, permitting the reversing of the engines on one side of the vessel while those on the other side are running ahead when making a turn. This operation is directed from the bridge by means of Chadburn instruments.

Steam is generated in fifteen double ended boilers of the Scotch type containing four furnaces in each end and making a total of 120 furnaces. All boilers are fitted for oil burning.

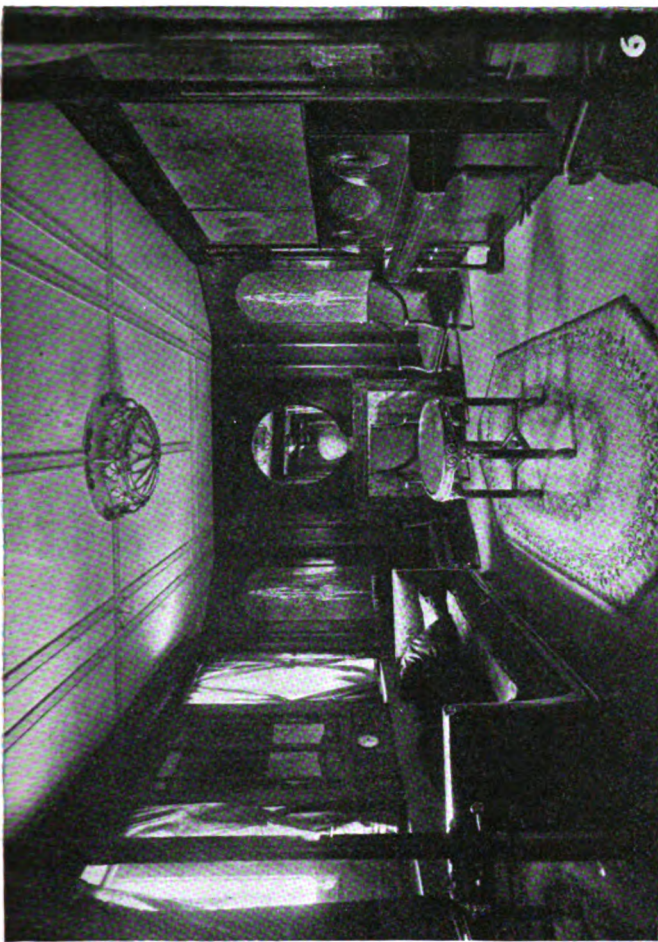
The sea trials of the *Paris* took place at Base des Glenans from June 5 to 9, 1921. The vessel was originally designed for a speed of 21.75 knots but during the trials averaged a speed of 22.4 knots, although only 12 of the 15 boilers were in operation. At one time, however, a speed of 23 knots was recorded with a minimum of vibration.



Interior Views, S. S. Paris: (1) Top of Grand Stairway, B Deck; (2) Main Stairway, First Class; (3) and (4) Dining Room, First Class



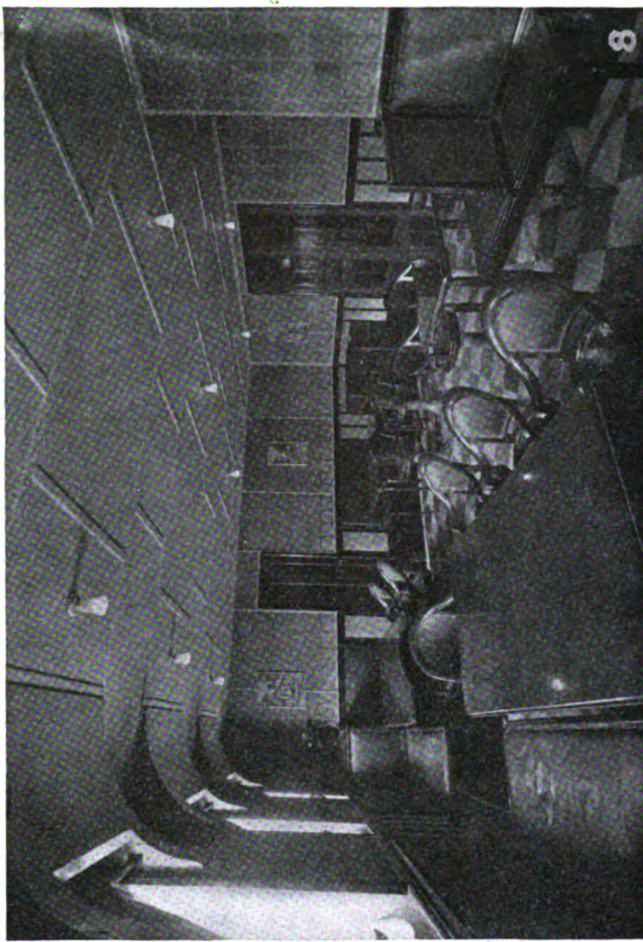
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7



8

Interior Views, S. S. Paris: (5) Palatial Suite, (6) Drawing Room in Palatial Suite, (7) Average First Class Stateroom, (8) Children's Dining Room

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Government Inspection of Merchant Vessels

By Commander J. B. Patton, U. S. N. (Retired)

In this paper the United States rules are compared with the rules of the British Board of Trade and the rules of the classification societies. It is realized that the manner of application of the rules is more important than the letter of the rules.

GOVERNMENT rules properly relate to the safety of life of passengers and crews and not to safety of property, but they should serve to prevent the owner from injuring the property of others, by collision, for instance. They properly provide for licenses of officers, navigational aids, signal lights, rules of the road, etc. They protect the sanctity of contract between owner and employee and between owner and shipper and underwriter.

The owner, underwriter and classification society have a common interest in rules for the protection of property. They rely on government rules for safety to life and prevention of fire damage.

INTERESTED PARTIES

- (1) The Nation (Army and Navy Reserves).
- (2) The Government.
 - Commissioner of Navigation.
 - Shipping Commissioners.
 - Custom House.
 - Steamboat Inspection Service.
 - Public Health Service.
 - International Conference.
 - (British Board of Trade.)
- (3) Shipowners.
 - American Bureau of Shipping.
 - Lloyd's Register of Shipping.
 - Underwriters of Hull.
 - Steamship Owners Indemnity Association.
 - Shipyards and Harbor Service.
- (4) Shippers.
 - Underwriters of Cargo.
- (5) Passengers.
- (6) Crew.

A brief outline of the rules is given under the following headings:

- I. Hull, Boilers, Machinery, Equipment.
- II. Lifeboats and Fire Apparatus.
- III. Loading and Stowage.
- IV. Tonnage.
- V. Crew Space.
- VI. Manning Scale.
- VII. Surveys and Inspections.

I.—Hull, Boilers, Equipment

UNITED STATES RULES

The Steamboat Inspection Service has very few rules for the hull, except those required by international agreements, such as the bulkhead requirements. But the rules of the American Bureau of Shipping are adopted as standards. The substance of the requirements are indicated below:

- (1) Owners are to submit drawings of new ships.
- (2) United States inspectors supervise repairs and alterations and examine ships when dry docked.
- (3) Living compartments to have two avenues of escape.
- (4) Auxiliary steering apparatus required. Mechanical sounding machine required.
- (5) To have a collision bulkhead, stern bulkhead, machinery space bulkheads and intermediate bulkheads not over 80 feet apart. These bulkheads to reach to the *second deck*, if the ship has two or more decks.
- (6) Submit drawings of fuel oil tanks; suction pipes to settling tanks must have internal gate valves with rods to upper deck.
- (7) Tail shaft to be drawn every three years.
- (8) Fit safety guards around machinery.

- (9) Make inclining test when stability is doubtful.
- (10) Examine air ports and inspect accessible parts of hull.
- (11) Steam pipes not to touch wood.
- (12) Bilge pump suctions and sounding pipes in each hold.
- (13) Electric rules are not stated fully. "Best modern practice" is required. Single wire system is not mentioned or disapproved.
- (14) Deck hand pumps are not required to have bilge connections.

UNITED STATES RULES FOR BOILERS

The design, materials and tests are specified in great detail. The rules are in accordance with good modern practice and are about the same as those of Lloyd's Register and the British Board of Trade. The material specifications are not difficult but the detailed inspection at the works is possibly unnecessary at this date and may inconvenience the manufacturers.

There are some obsolete laws such as the rule for obtaining the working pressure on cylindrical shells, which is:

"Multiply one sixth of the tensile strength by the thickness of plate, and divide by the radius in inches, plus 20 percent when the seam is double riveted." The Supervising Inspector General has recommended the repeal of this.

- (1) Submit drawings for approval.
- (2) Pressure allowed on cylindrical shells.
- (3) Pressure allowed on flat surfaces or curved heads.
- (4) Man holes, hand holes and pipe connections.
- (5) After ten years the boiler shell to be drilled to obtain thickness.
- (6) Water test to $1\frac{1}{2}$ times working pressure, when built and annually thereafter, including main steam pipe.
- (7) Design of riveted joints (same as British Board of Trade).
- (8) Design of butt straps and combustion chambers.

$$(9) \text{ Rules for working pressure of furnaces: } P = \frac{C \times T}{D}$$

where C varies from 14,000 to 17,300, according to type of furnace.

(10) The physical test of shell and furnace plate requires only 20 percent elongation, which is easy to obtain.

(11) The tube tests are not difficult, 1000 pounds water test is required.

(12) Fusible plugs in tops of combustion chambers. These plugs appear to be a wise precaution. They are not required on watertube boilers.

(13) Gage cocks, valves, etc. The requirements are about the same as other authorities. A *single* safety valve is required.

(14) Watertube boilers. Design to be submitted for approval. Malleable iron fittings are allowed. On the drums the seams and re-enforcing rings are to be welded. When new, the water test pressure is double the working pressure and $1\frac{1}{2}$ times the working pressure annually thereafter.

(15) The rules permit repair of all boilers by welding, and are in accordance with good modern practice. The rules are similar to those adopted by technical associations for land boilers. Welding is allowed generally on stayed surfaces, and compression members. On parts subject to tensile stress it is only allowed as follows: cracks in shell may be repaired by a spot welded strap; shells corroded only 25 percent of thickness may be built up; manifolds, headers and fittings may be welded.

(16) Main steam pipe. The working pressure allowed on riveted pipes is given by the obsolete law for cylindrical shells. This appears to allow too great a pressure. For lap welded and solid drawn steel pipes the formula for thickness is:

$$T = \frac{P \times D}{10,000} + 0.125$$

(17) Lloyd's Register uses the same formula, but the divisor is 9,000 for lap welded and 12,000 for solid drawn steel. The American Bureau allows 10,000 for lap welded, or 12,000 for solid drawn steel.

(17) Pipe fittings, valves, flanges, etc. The materials used and manner of attaching same to boilers are specified in some detail. The qualifications must be guaranteed and stamped by the manu

facturer or an affidavit made. Screwed joints are allowed on boiler connections up to 2 inches, and up to 3 inches elsewhere. Cast iron can be used for temperatures up to 450 degrees, and hard brass up to 550 degrees. For pressures over 300 pounds or temperatures over 550 degrees, cast steel, or a composition of over 50,000 pounds per square inch tensile strength and 10 percent elongation is required. Screwed bonnets are only allowed on brass valves, 2 inches or less in size. Brass fire main valves 2½ inch size have been rejected on account of screwed bonnets. This seems an unnecessary rejection.

THE BRITISH BOARD OF TRADE RULES

The British Board of Trade rules correspond with the work of the Steamboat Inspection Service in the United States, and in addition they have other important duties such as carrying out the laws relating to merchant seamen, Custom House rules, regulation of stowage of cargoes, deck loads, explosives and dangerous goods, tonnage measurement, crew space and approval of the load line mark as fixed by Lloyd's Register. They also have a very important department for the development of overseas trade. The Board of Trade rules for hulls, boilers, machinery, anchors, chains and equipment are specified in detail, and ships are built under their survey, but they correspond very closely with Lloyd's Register. Their surveys are directed principally towards the safety and comfort of passengers and crews rather than the safety of property. Their surveyors' report includes the following items:

- (1) That hull and machinery are in good condition, and efficient.
- (2) Dry dock examination.
- (3) Bulkheads and watertight doors.
- (4) Rudder, bottom valves, ceiling.
- (5) Hatches, openings in side.

BOILERS AND MACHINERY

No survey on donkey boiler or winches.

- (1) Shaft and bearings.
- (2) Pistons, valves, pump buckets and valves; boiler surfaces and valves. Tail shaft.
- (3) Inside of boiler to be examined or else a hydraulic test to double the working pressure. On first survey for certificate, the boilers have a hydraulic test to double the working pressure, and after important repairs to 1½ times the working pressure. It is reported a new rule is coming out fixing the test at 1½ times plus 50 pounds for new boilers.
- (4) It is desirable, but not mandatory, to drill staybolts.
- (5) Quality of materials and test of steel are specified.
- (6) Steam pipes. Copper pipes are tested to twice the working pressure. Every four years main steam copper pipe (braced) to be tested also. Every six years iron and solid drawn copper main steam pipes to be tested.
- (7) Feed pipe to have relief valve. Each boiler to have two feed lines with checks and stop valves. Bilge pipes connected with sea to have a non-return valve.
- (8) Spare parts, anchors, chains and shackles to be examined annually. Spare tiller and signals. No mechanical sounding machine required.
- (9) Rules for deck pumps are not clear, but appear to be as follows:

A deck hand pump for each compartment. Or, one deck hand pump connected to bilge suction system, provided there is a valve rod from deck to each suction. Or, no deck pump required if there are duplicate steam pumps and boilers in separate watertight compartments.

AMERICAN BUREAU RULES

The American Bureau has rules in agreement with the British Corporation and the Italian classification society.

- (1) Rules for design, construction and tests of steel ships, including oil ships.
- (2) Rules for design, construction and tests of boilers, machinery and anchor gear.
- (3) Rules for internal combustion engines.
- (4) Rules for refrigerating plants.
- (5) Rules for electric plants.
- (6) Bulkheads extend to upper deck. Watertight doors to be worked from bulkhead deck. Rules are stricter than United States law.
- (7) Engine room suction pipe to fore peak tank must have a stop valve at collision bulkhead with rod to deck. A deck pump is required to be connected to bilge drainage system. Rules for anchors are about the same as Lloyd's.
- (8) On oil burners, suction from service tanks must have

valves worked from machinery space as well as from weather deck outside of casings of boiler room.

- (9) Specifications for ships to carry oil in bulk.
- (10) Specifications for ships burning fuel oil.
- (11) Specifications for boiler and hull material and engine material.
- (12) New boilers are tested to 1½ times working pressure. Watertube boilers to double the working pressure. Headers of cast steel to three times the working pressure. Tubes are tested to 1000 pounds.
- (13) Electrical specifications conform to the rules of the American Institute of Electrical Engineers and the National Electrical Code. The single wire system is disapproved.
- (14) Rules for tests of anchors and chains.
- (15) Spare parts to be carried.

LLOYD'S REGISTER

- (1) Rules for building of steel vessels including oil carriers and oil burners.
- (2) Tentative rules for application of electric welding to ship construction.
- (3) Rules for survey and construction of engines and boilers.
- (4) Rules for the survey and construction of Diesel engines.
- (5) Refrigerating machinery.
- (6) Freeboard markings. Collision bulkhead extends to the upper deck. The rule for hand pumps on deck is about the same as the Board of Trade rule.
- (7) On oil burners, suction pipes from fuel tanks are to have valves in machinery space, with rods to deck outside of machinery space casing.
- (8) Single wire electric system approved, except on ships with cargo oil.
- (9) Calculation of working pressure of shells and furnaces.
- (10) Copper steam pipes to be given a water test to double working pressure.
- (11) Two safety valves required for each boiler.
- (12) The rules for bulkheads are more in detail than those found in the American Bureau rules. This subject is in an unsettled state. The requirements are based on the recommendation of the International Conference on Safety at Sea, London, 1914. This conference adopted rules for:
 - (1) Ice patrol.
 - (2) Lifeboats and certification of lifeboat men.
 - (3) Hull construction and subdivision.
 - (4) Radio equipment.
 - (5) Annual safety or inspection certificates for passenger ships.

II.—Lifeboats, Fire and Safety Apparatus

UNITED STATES RULES

These rules are very strict and are no doubt the result of many boiler and fire accidents on inland passenger steamers. They are excellent for passenger ships but some of them seem unnecessary for steel cargo ships with small crews of hardy men.

Lifeboats and davits are specified in numbers according to the length of the ship. Take, for example, a passenger ship from 410 to 435 feet in length:

- Minimum number of sets of davits, 12;
- Minimum number of first class boats, 9;
- Minimum capacity (persons), 1,306.

The ship may not be required to have a greater number of boats and davits than needed for the persons on board.

If more than 1,306 persons are on board, the excess may be carried on rafts, provided that three-fourths of the total must be in boats. Boats in excess of the 9 specified may be collapsible boats. If not practicable to put on the full number of davits, the number may be reduced to nine.

If a number of lifeboats longer than 50 feet are provided, a further reduction of davits may be allowed, provided that after a prescribed test it is found that the boats can be lowered in ten minutes.

Passenger vessels of over 2,500 tons *shall* carry one motor lifeboat. On vessels carrying more than six lifeboats, two may be motor lifeboats.

Cargo ships are to carry sufficient boats on each side for all the crew.

Boat davits are to be tested and approved.

Boats are to have a cubic capacity of ten feet for each

person. They are to have air tank capacity of one cubic foot in the case of wooden boats, and one and a half cubic feet in the case of metal boats, for each person.

Two Lundin boats may be stowed under one set of davits. At the annual inspection all boats are to be lowered, loaded and the falls tested.

Boats are to be equipped according to rule and certified lifeboat men furnished. The design and inspection of boats and davits and detaching apparatus are specified in detail, but there is a wide choice and no monopoly of makers.

Approved life preservers are required for each person on board. For the above ship 18 ring buoys and nine water lights are required. A line gun and three projectiles are required on all vessels. Storm oil is required for all ships.

The nine first class boats specified are open boats with buoyancy. Others needed may be collapsible boats with buoyancy of approved type. Pontoons and rafts are to be of approved type.

BRITISH BOARD OF TRADE RULES

Passenger ships, 390 to 450 feet long:

Minimum sets of davits, 12;

Minimum number open boats, 9;

Minimum capacity (persons), 550.

The ship is not required to have a larger number of boats and davits than needed for all persons carried.

The "open" boats have inside buoyancy or both inside and outside buoyancy of approved design, lifeboat type, with pointed ends. Additional boats required may be "decked" boats. The latter may be stowed at davits under an open boat, or may be stowed at davits in nests of three.

Where more than four lifeboats are required, two may be square stern boats with buoyancy. For this size of ship 18 ring buoys are required.

The Board of Trade rules do not allow life rafts. The above scale requires a "minimum" lifeboat capacity for 550 persons and the rules require lifeboat capacity for all on board. One-fifth of the lifeboats may be motorboats (optional).

British cargo ships are to carry lifeboat capacity on each side for all persons on board. If more than two boats are required, one may be a "square stern" boat. If more than three are required, two may be "square stern" boats. Cargo ships require 6 ring buoys and a full set of life preservers.

The design of boats, detaching apparatus and davits is specific in detail. In passenger ships the British rules are about the same as the United States rules.

Foreign vessels in United States ports are subject to United States inspection, but there are reciprocal agreements whereby the inspection of British ships is made according to their rules. British rules do not require line guns, or storm oil.

FIRE APPARATUS, UNITED STATES RULES

(1) Axes and buckets and fire extinguishers.

(2) Steam smothering lines, 1½ inch to holds and separate compartments and ¾ inch to lamp lockers and oil rooms. Carbonic acid gas or other approved gas may be used instead of steam. Foamite is approved for oil tankers and oil fuel compartments. Fire lines and hose are tested to 100 pounds pressure, and a relief valve is to be fitted. The size is to be not less than the discharge of the fire pump, but it is customary to use 2½ inch hose, or 1½ inch on the smaller vessels. The arrangement of the fire main and hydrants must be so that one 50-foot hose will reach any part of the ship, except on iron cargo ships where it is sufficient for it to reach any part of the cabins or superstructures.

Passenger ships require two hand fire pumps, with sufficient hose to reach any part of the ship. Cargo ships require one such pump. If the pump discharges into the fire main, the extra hose is not required. These laws are not clearly stated, and appear to need revision.

(3) Electric alarm bells worked from the pilot house are to be placed in sleeping quarters when no watchmen are on duty. These alarm bells and "safety first" signs seem unnecessary on cargo ships.

(4) Automatic fire alarm in passengers' sleeping quarters and other compartments not under observation of officers and crew. This appears to be a good thing on passenger ships. The only approved systems mentioned in the rules are the Rich system and the Aero alarm system.

(5) Automatic water sprinklers are required on passenger ships, in galleys and sleeping quarters below the main deck.

(6) Auxiliary lighting set. This is not required if oil lamps are provided and kept lighted at night. This must be above the main deck and furnish light to show passengers to the exits and boats.

(7) Radio set for all ships having over 50 persons on board. To have auxiliary power good for four hours, a range of 100 miles, and an operator continually on watch. United States laws require one licensed operator and one assistant. (International Agreement.)

The British Board of Trade rules are rather brief. Passenger ships are required to have the fire main and hose so arranged that two lengths will reach simultaneously the holds, bunkers or living quarters (to be tested annually). Nothing is said about cargo ships. Steam smothering lines are sometimes seen on British cargo ships.

Radio apparatus is required on all British ships over 1,600 tons gross, and on similar foreign ships in British ports.

III.—Stowage of Cargoes, Explosives and Dangerous Goods

UNITED STATES RULES (SECTIONS 4278-4279)

Nitroglycerine or dynamite is not allowed on passenger ships nor on freight ships unless packed and marked accordingly to rule.

Section 4288. When acids, matches, lime or gunpowder are delivered to a ship, written notice of the nature of the goods must be furnished to the master.

Section 8, Law of 1882, forbids certain explosives and dangerous goods on immigrant ships.

The Supervising Inspector General in his last report to the Secretary of Commerce has recommended that the following laws be amended or repealed and that the Inspector General be authorized to formulate regulations for the carriage of dangerous goods on ships:

Section 4422, allowing gunpowder on passenger ships having magazines (repeal).

Section 4472, regulating dangerous goods on passenger vessels (amend).

Section 4475, regulating marking of explosives and dangerous goods (repeal).

In amending Section 4472 it is noted that he retains the clause specifying kerosene oil for stores on passenger ships to have a fire test of 300 degrees. This seems too high, as fuel oil of 150 degrees test is being safely used on passenger ships.

The Inspector General is undoubtedly right in his proposal to amend obsolete laws, and to formulate modern and complete rules. However, there is a danger to the life of commerce when he intimates extending passenger ship rules to freight ships as approved by the classification societies.

The rules for transportation of explosives and dangerous goods by rail were formulated and to a certain extent are executed by the Bureau of Explosives of the American Railway Association, and approved by the Interstate Commerce Commission. Any new rules for ocean transportation should be submitted by the owners, shippers and underwriters and approved by the government.

The question is now settled by the recent law of March 4, 1921, section 323, which directs that the Interstate Commerce Commission make rules for the safe transportation of dangerous articles on ships departing from or arriving at American ports.

The master of every sea-going vessel shall, whenever leaving port, enter the maximum draft of his vessel in the log book. The master shall see that the hatches are secure. The owner or master is required to see that the cargo is properly stowed and the ship seaworthy.

The United States has no rules as to load line, or deck

loads, or stowage of grain or lumber. The owner protects himself by employing a representative of the underwriters and getting a loading certificate, showing the draft forward and aft.

The British Board of Trade has rules controlling the deck load, grain cargoes, dangerous goods and load line. They co-operate closely with commercial bodies and have adopted Lloyd's rule for the load line and the rules of the National Board of Marine Underwriters at New York, New Orleans and Mobile, the Wheat Tariff Association of San Francisco, for grain cargoes.

FREEBOARD

The freeboard on British ships is fixed by Lloyd's Register, the Bureau Veritas, or British Corporation, and the load line is marked according to the Board of Trade rules. The Board of Trade, after approval of the mark, issues a certificate. Foreign ships may receive a certificate direct from Lloyd's, or the American Bureau, or from the other classification societies.

Tonnage openings may affect the load line as shown in the following rule of the Board of Trade:

"As regards all vessels which have deck erections in respect of which deduction has been made for freeboard, if any change tending to invalidate the right to such deduction is made in the structural condition of the deck erections, the certificate of approval of load line shall, therefore, cease to have effect."

IV.—Tonnage

The United States rules for measurement of gross and net tonnage are about the same as the British rules.

Shelter deck space with tonnage openings and deck structures with tonnage openings are now exempt from measurement for gross tonnage. Double bottoms and other places for water ballast are also exempt from gross tonnage.

The cutting of tonnage openings and the measurement of light and air space over engine and boiler spaces, above the upper deck, are optional with the owners.

Passenger quarters above the first tier on the upper complete deck are exempt.

British rules do not exempt such passenger quarters, nor do they exempt deep water ballast tanks, but the latter are deducted for net tonnage. If sheltered places that are exempt have a deck cargo in them, the space is taxed by British rules.

The deductions from gross tonnage to obtain net tonnage includes machinery spaces, crew accommodations, store rooms, etc., and are about the same under United States and British rules.

V.—Crew Space

UNITED STATES RULES

"Lodging space" for the crew is to have 16 square feet of deck space and 120 cubic feet of air space for each man. One berth must be provided for each man, and not more than one over another. Crew's quarters are to be lighted, heated, drained, ventilated and protected from the weather.

The law does not mention mess rooms. These are sometimes arranged in the lodging place.

(1) Ships with 12 or more seamen to have a separate compartment for a hospital, containing one bunk for each 12 men, but not more than 6 are required.

(2) Ships having 10 or more men on deck to have a washroom with one washing outfit for each two men of the watch. If there are more than 10 engine and fireroom men, washrooms are required large enough to accommodate one sixth of them at one time, and to have hot and cold water, basins, sinks and showers.

The British rules are not as liberal as the United States rules.

(1) Each man is entitled to 15 square feet of deck space, and 120 cubic feet of air space, of which at least 12 square feet and 75 cubic feet must be for their sleeping place, and the remainder for messrooms and bathrooms. Mess tables and seats to be in the sleeping room unless provided elsewhere.

Hospitals and washrooms may be provided and deducted from net tonnage. They are not required.

(2) Light, heat, drainage, ventilation and protection against weather and from bad odors are specified in great detail. Steel decks overhead must have a wood deck laid on them. Floors of crew space to have a wood deck. Bare steel surfaces to have cork cement.

The Norwegian rules require about the same amount of space, but each two men must have a separate room.

STEERAGE PASSENGERS

The United States rules as regards space are a little more liberal than British rules. The United States rules apply to all vessels coming to this country, so that American ships are under no handicaps. Each passenger is entitled to 21 square feet on the lower deck and 18 square feet on the upper deck. The British rules are 18 and 15 square feet.

VI.—Manning Scale

UNITED STATES RULES

The United States law requires:

Master and three mates.

Licensed engineers.

Licensed radio operator in charge.

Officers to be citizens.

On mail subsidy ships, one half the crew to be citizens, and such ships to carry one cadet for each thousand tons (gross).

On all ships 65 percent of crew to be able seamen (must be 19 years of age and have three years service on deck and on ocean or lakes). They may be rated able seamen after one year's service and a special examination, but not more than one-fourth of the able seamen may be of this class. Seventy-five percent must understand any order given by the officers.

Certified lifeboat men amounting to 4 to 6 percent of the total number of crew and passengers.

Sailors are to be in two watches and firemen, oilers and water tenders in three watches. At least two radio operators on ships having more than 50 persons on board. In port no unnecessary work on holidays, and nine hours work day.

The remainder of the complement is fixed by the local inspectors. Their rules give usually a minimum of four engineers.

The manning scale fixed by the government inspectors is not excessive, and it is usually less than that which the trade unions demand from the owners.

BRITISH RULES

International agreement requires certified lifeboat men and radio men.

Foreign going ships require a master, two licensed mates and two licensed engineers. Officers are not required to be British subjects.

Ships carrying more than 50 steerage passengers are called "emigrant" ships. They must carry "deck hands" amounting to approximately 5 to 7 percent of the total number of persons on board. For a 3,000 horsepower ship, approximately five engineers, one deck engineer, three oilers, one storekeeper and one fireman for each furnace (18 square feet of grate surface) are required.

Foreign going ships must have deck crews as follows:

Ships over 700 tons gross to have one master, two mates, six "efficient deck hands"; ships over 2,500 tons: one master, two mates, eight "efficient deck hands"; ships over 5,500 tons, master, two mates, ten "efficient deck hands."

In regard to the crews there are no qualifications except that men shipped in the United Kingdom or in the Channel ports must have sufficient knowledge of English to understand necessary orders, but this does not apply to any British subject or inhabitant of any British Protectorate, or to any Lascar. Discharge tickets are given and are considered important when shipping men. Owners also consider trade union rules.

VII.—Inspection and Surveys

UNITED STATES RULES

Ships are inspected annually, and whenever any important repairs are going on. Boilers and main steam pipe are given a water test of $1\frac{1}{2}$ times the working pressure. The Inspector General has recommended that this law be amended, so that the Steamboat Inspection Service would decide what hydrostatic test to apply. He does not indicate what new rule he would formulate.

Boilers ten years old are to be drilled at the water level. Fusible plugs are renewed annually, and the fire extinguishers refilled, hose tested, hand pumps tested and lifeboats examined. The report includes information as to whether the ship is seaworthy, the manning scale, passengers allowed; and also if the navigation and other safety equipment is correct.

BRITISH BOARD OF TRADE RULES

Passenger and emigrant ships are inspected annually. The surveyor's report includes:

That the hull and machinery are sufficient for the service intended, and are in good condition.

That boats, life buoys, lights, signals and compasses are in good condition.

The number of passengers the ship is fit to carry.

Certificates of master, mates and engineers are correct.

Safety valves and fire hose in required condition.

The chain shackles are inspected annually.

The boilers are inspected inside and outside. If unable to enter the boiler, the hydrostatic test of double the working pressure will be given.

There are no detailed rules for the annual inspection of cargo ships.

Boilers are inspected annually after six years. Copper main steam pipes are tested every four years. Iron or solid drawn copper main steam pipes, and auxiliary steam pipes over 6 inches, are tested every six years.

LLOYD'S REGISTER—PERIODICAL SURVEYS

Four year survey. (1) Ship in dry dock. Clear holds and bunkers. Partial raising of ceiling over bilges. Ceiling over tank tops removed. Tanks examined inside and tested. Frames and outside plates to be examined, cleaned and coated. Oil tanks need not be cleaned and examined inside on first survey. Examine wood decks, masts and spars, windlass, pumps, steering gear and watertight doors.

Eight year survey. (2) Same as (1), cables to be ranged.

Twelve year survey. (3) Same as (2), all ceilings removed. All frames and plates to be exposed, rust removed and surfaces coated. Remove some insulation of refrigerative chambers. Plating to be drilled, if necessary.

Sixteen year survey. Second No. 1. Same as eight year survey. Range cables, examine inside of oil tanks. Examine some frames behind insulation of refrigerating chambers.

Twenty year survey. Second No. 2. Same as eight year survey. Examine some framing behind insulation of refrigerating chambers.

Twenty-four year survey. Second No. 3. Same as twelve year survey. Examine scantlings, completely drilling where necessary. Remove all refrigeration insulation. Three holes to be drilled in each strake where not cemented.

MACHINERY AND BOILERS

To be surveyed annually, when practicable, and on the dates of special surveys, unless examined within 12 months. Shafts to be examined annually and tail shaft drawn every three years. At the periodical surveys the machinery and boilers will be examined and boilers drilled or given hydrostatic pressure if necessary.

The boilers are to be surveyed when six years old, and

annually thereafter. To be drilled and hydraulic test made if necessary.

AMERICAN BUREAU RULES

Four year survey. (1) Ship in dry dock. Holds and bunkers, bilges cleared, and all framing and plating cleaned and recoated where needed. Remove part of bilge ceiling and all of tank top ceiling. Examine inside of all tanks and test all tanks.

Bore the wood decks.

Examine mast, spars, rigging, hatches, ventilators, deck houses and engine casings. Examine steering gear, windlass, pumps and doors.

Eight year survey. No. 2. Same as (1). Range cables.

Twelve year survey. No. 3. Same as (2). Lift rudder. Remove all ceilings and clean the rust off all parts of the structure and re-coat. Drill the plating where necessary. Make complete examination of structure.

Sixteen year survey. Second No. 1. Same as eight year survey.

Twenty year survey. Second No. 2. Same as eight year survey.

Twenty-four year survey. Second No. 3. Same as twelve year survey. Each strake of shell plating to be drilled about amidship, and at not less than one-fourth of the vessel's length from each end. Additional plates to be drilled near machinery spaces, around the counter or where corroded. Deck plating to be drilled. Part, or all if required, of the refrigeration insulation to be removed.

ENGINES AND BOILERS

To be surveyed at the time of special surveys to the hull. Tail shaft to be drawn every three years. Boilers to be examined inside and out. If considered necessary, the plates are to be drilled and boilers tested by hydraulic pressure. The main steam pipes will be tested by hydraulic pressure in the case of brazed copper pipe every four years, and in the case of iron or steel pipes or seamless copper pipes, every six years.

The boilers are to be surveyed when six years old, and annually thereafter.

CLASSING OF SHIPS

The Supervising Inspector General in his last report recommends that the ships be classed by the Government. But he adds that it is doubtful if the Government would pay sufficient salaries to obtain the technical experts.

It is not clear what is meant by Government classification. Classification societies were founded originally by the underwriters for their own information. At present the owners pay for the service; it standardizes construction and forms a basis for the contract between owner, shipper and underwriter. The rules are flexible and subject to conference. Such would not be the case with government rules for shipbuilding.

CONCLUSION

The United States steamboat inspection rules were formulated by competent officials and they are usually enforced in a common sense manner. But the inspection of cargo ships seems to be too strict and too frequent.

The United States merchant ships do not appear to bear any unreasonable burden due to technical rules. Their success is largely a matter of *personnel* afloat and ashore. There appears to be a tendency of both the Government and ship-owners to yield to unreasonable demands of trade unions. The law should encourage Americans to become seamen and there should be no service qualification to become able seamen and lifeboat men and firemen. There are at least eight licensed officers on every ship and they should be able to train green men. It was done on a grand scale during the war, when lifeboats could be safely lowered in a few minutes.

Every day we see boys learning to handle motorboats and automobiles in a short time.

Thirty years ago naval ships were largely manned by foreigners. An American was not at home on board. Training ships for American boys were maintained for years, but the boys would not stay in the service. The training ships will produce officers, not crews. Twenty years ago the Navy began recruiting its young men in the inland towns, principally in the middle West. These men were given a very short training and then put on board the war vessels. These men became well trained and stayed in the service. Our present fine American personnel was built up that way and the foreigner has almost disappeared. These foreigners were good men but, being of various races, a harmonious organization was impossible.

The nation has decided it wants a merchant marine and that means it is going to have it; just how, and when, no one knows. Shipping men know that we are far from it now. Congress has been unwilling to give a subsidy to *steamships*; but it will subsidize the *man* by naval reserve pay, and the ship will profit indirectly.

The Naval Reserve Law of 1916 is a great success. It was administered with the view of making the merchant service help the Navy, and it succeeded. It enabled us to win the war. Now, in times of peace, it could be administered so as to make the Navy help the merchant service, which would help the Navy in the end.

THE REGULATIONS FOR THE NAVAL AUXILIARY RESERVE,

(class 3), with some slight modifications, would cover the requirements.

(1) Citizens in the merchant service to be enrolled in a suitable rating (as now). Men seeking employment to be enrolled also.

(2) Reservists employed on ships to be confirmed at once for the retainer pay of two months' pay each year. Naval rating to increase with their employment rating, with little formality.

(3) Officers to be enrolled and confirmed, or promoted and confirmed without any professional examination except a short oral examination on naval customs and discipline. A short instruction book should be furnished. Officers cannot leave their employment to undertake the training on naval vessels, and none should be required. The United States Post Office Department would not give its employees a vacation to undertake reserve training, and a private corporation cannot be expected to do so.

(4) To continue drawing retainer pay, the reservist should continue to be employed in a position with a rank or rating equal to, or greater than, his naval rank.

(5) The regulations should include men in the stewards' department.

After a few years the amount of naval training required could be increased.

The good effect of this plan would not be apparent at once, but it would surely grow in importance.

Curves of Effective Horsepower

For Typical Destroyers, Yachts, Gunboats and
Tugs, Covering Speeds of from 10 to 20 Knots

By James L. Bates*

RECENT experience in the preliminary or basic design of underbody for yachts and for other vessels having similar coefficients has shown the need of data so arranged that approximate powers may be readily obtained without the careful calculations which are customary at a later stage when the design has taken a definite form. Such data when available make possible an investigation of dimensions and coefficients and the effect of their variation with a thoroughness not possible when detailed calculations of considerable length are necessary in order to obtain the power for each set of dimensions and coefficients considered.

In the 1920 edition of the *Shipbuilding Cyclopedia*, published by the Simmons-Boardman Publishing Company, New York, there may be found curves of constant effective horsepower for destroyers and fast yachts having values of longitudinal coefficient of 0.62 to 0.66, values of displacement-length coefficient of 40 and 45 and covering speeds in excess of 22 or 23 knots. These curves are applicable only to vessels of the characteristics shown and within the speed range indicated. Even for vessels of this class, it is neither economical nor safe to cruise always at the maximum designed speed. It is usual, therefore, to specify that a given radius of action must be obtained at a selected speed considerably less than the designed maximum. As a result in fixing displacement, dimensions and coefficients, it is desirable to have power data covering the lower speeds, say from 10 to 20 knots. Figs. 1 and 2 have been developed to meet this need.

So much for vessels intended to have high speed: large yachts intended primarily for ocean cruising, coastal pas-

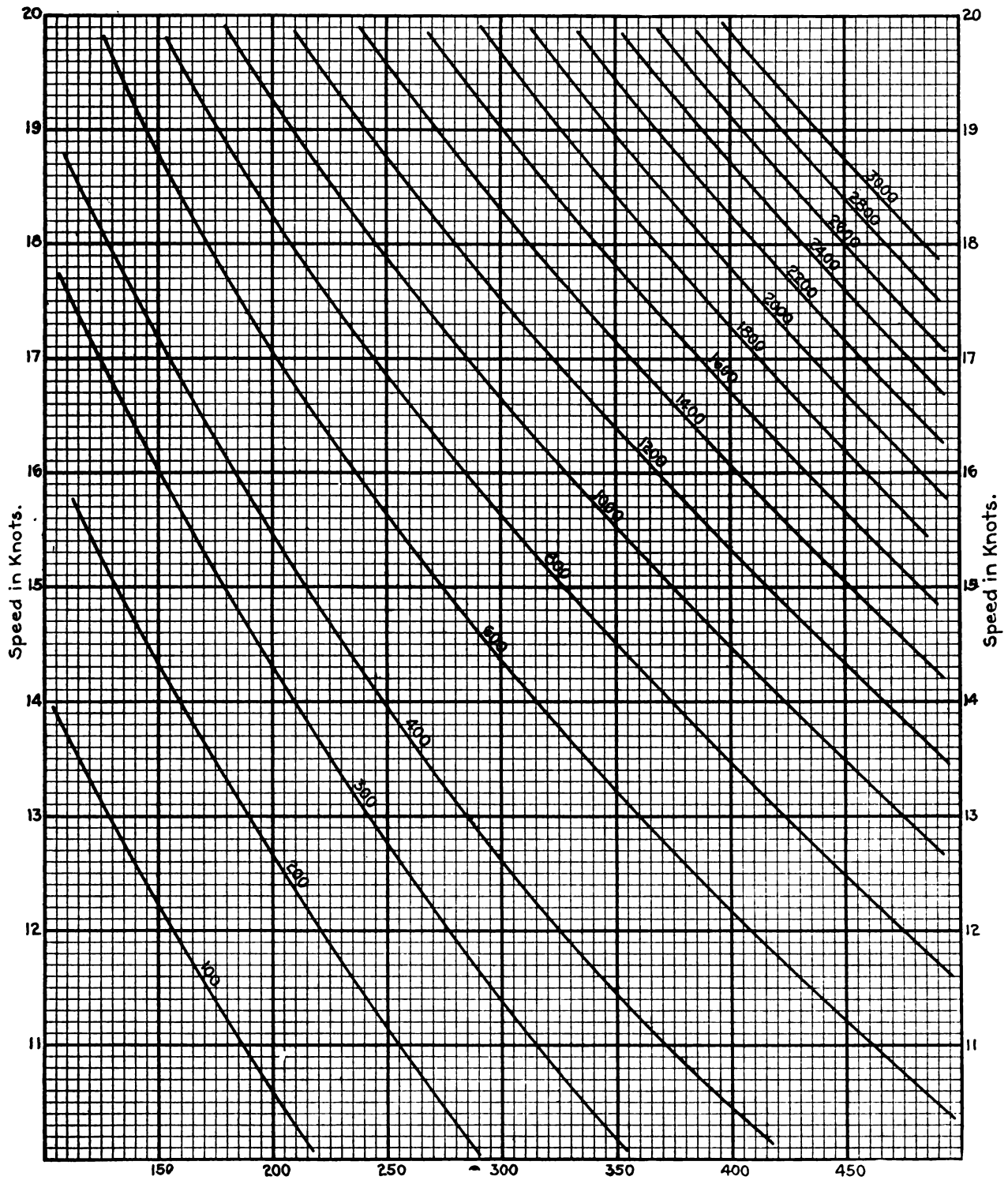
senger vessels, gunboats and certain seagoing tugs cannot wisely be given values of longitudinal coefficient as high as 0.62 or 0.64. Moreover, designers of these classes of vessels usually put much more displacement upon a given length than is contemplated in the plates referred to above. To illustrate the foregoing, see the table below:

CHARACTERISTICS					
Type	Length	Displacement	Longitudinal Coefficient	$\frac{\Delta}{L^3}$	$\frac{P}{\sqrt{L}}$
Passenger vessel	411	6940	.552	$\frac{100}{100}$	1.085
Intermediate type	520	17470	.576	124.3	.832
Yacht	160	568	.59	138.5	.91
Yacht	210	950	.59	102.8	1.31
Gunboat	221	1371	.584	127.1	1.075
Gunboat	225	1575	.565	138.5	.8
Seagoing tug	180	950	.578	163	1.05

Evidently all of the above vessels lie well outside the range of the coefficients (both longitudinal and displacement length) covered by Figs. 1 and 2. Accordingly, there have been prepared Figs. 3, 4 and 5, covering powers for vessels having a longitudinal coefficient of 0.56, displacement length coefficients of 100, 125 and 150 respectively and speeds of from 10 to 20 knots.

In the preparation of these plates the writer has based his work upon Taylor's "Speed and Power of Ships," but has made use of experimental model results for typical ships of good form to increase the range covered and to make the curves as nearly representative of actual practice as possible. The accuracy of the results obtained from the curves will depend upon the degree of similarity existing between the

*In charge of basic design, Bureau of Construction and Repair, United States Navy, Washington, D. C.



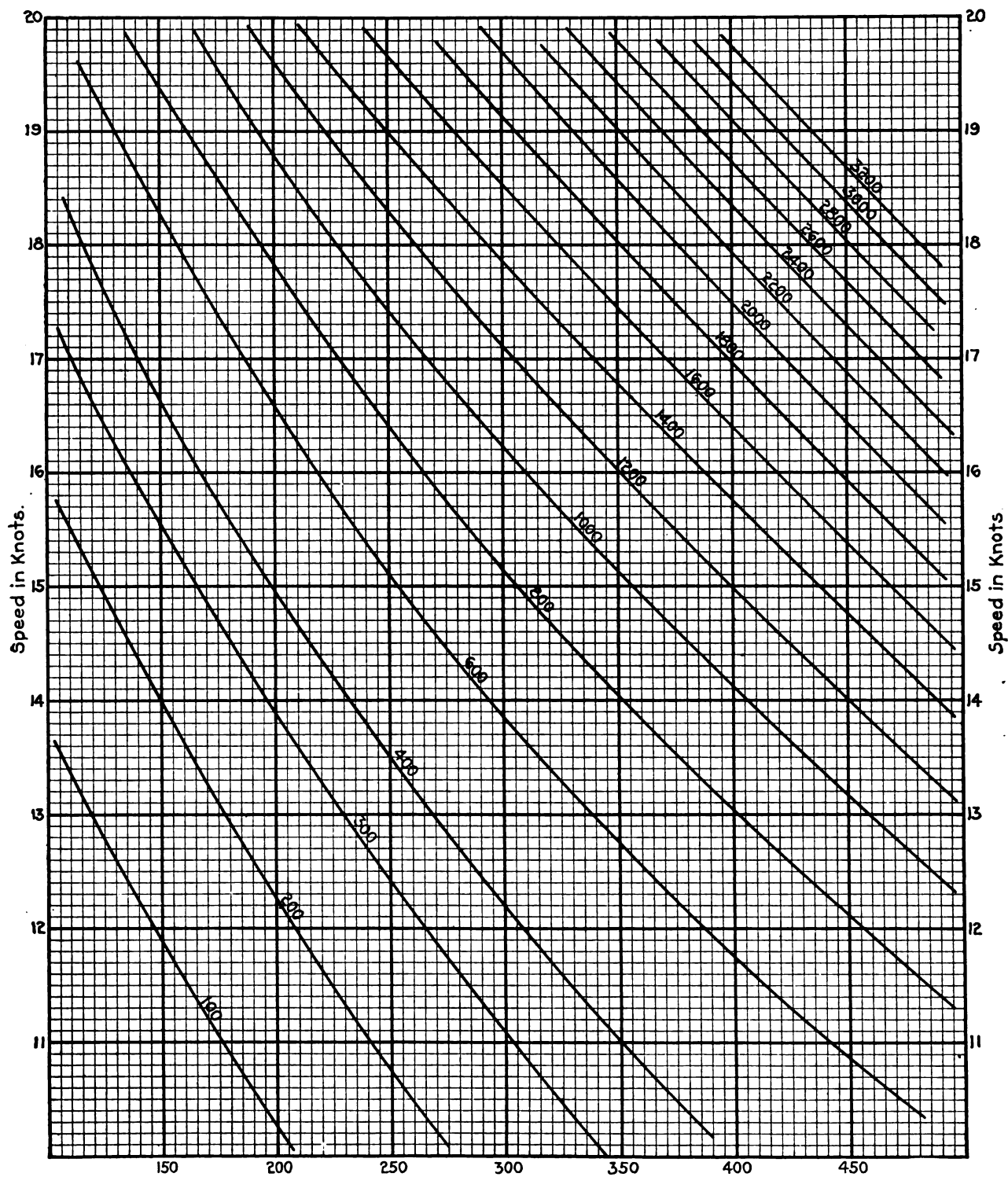
Length of Vessel on L. W. L.

Midship Section Coefficient = .75 to .83

Longitudinal Coefficient = .62 to .66

Displacement Length Coefficient = 40

Fig. 1.—Curves of Effective Horsepower for Destroyers and Fast Yachts



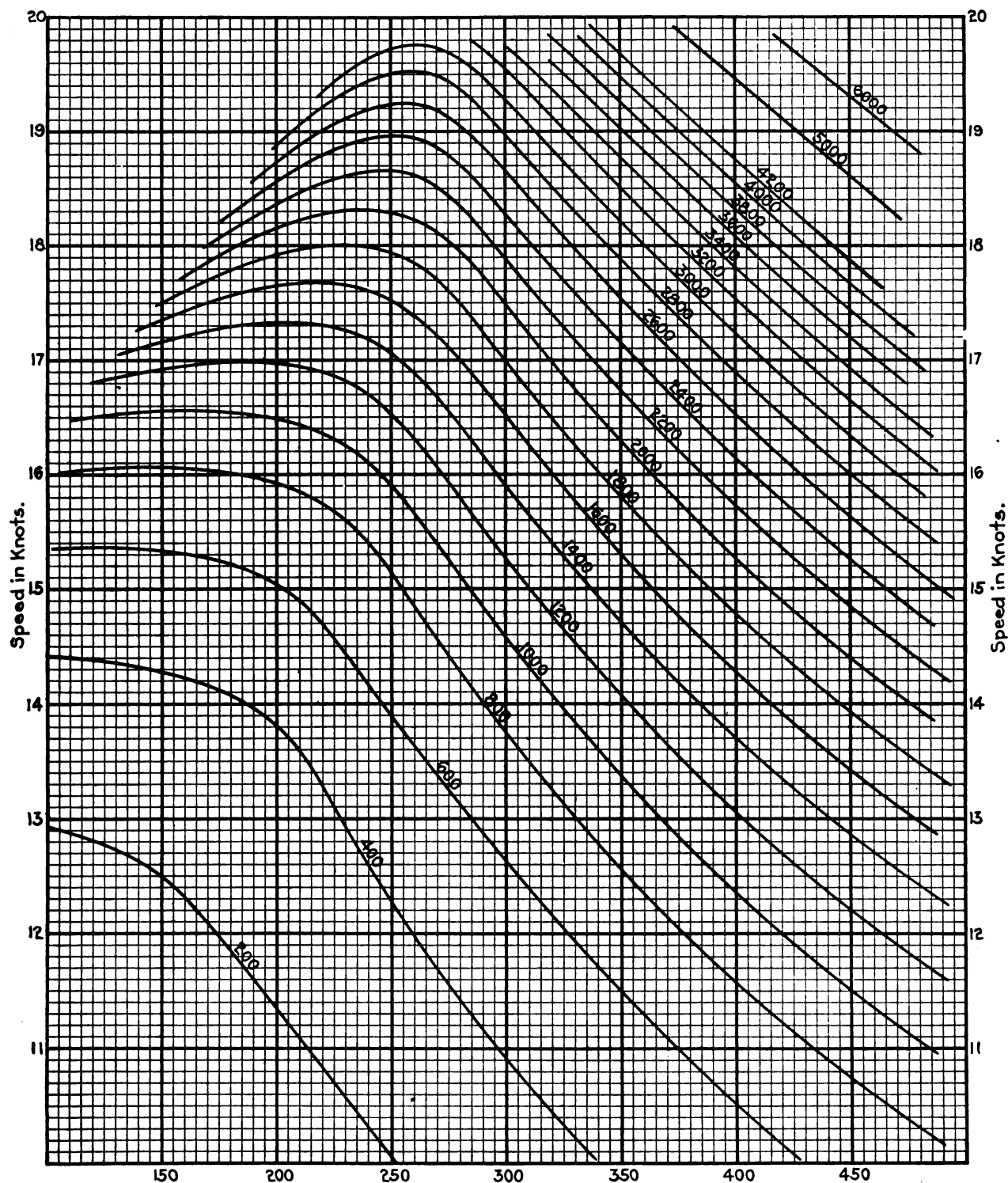
Length of Vessel on L. W. L.

Midship Section Coefficient = .75 to .83

Longitudinal Coefficient = .62 to .66

Displacement Length Coefficient = 45

Fig. 2.—Curves of Effective Horsepower for Destroyers and Fast Yachts



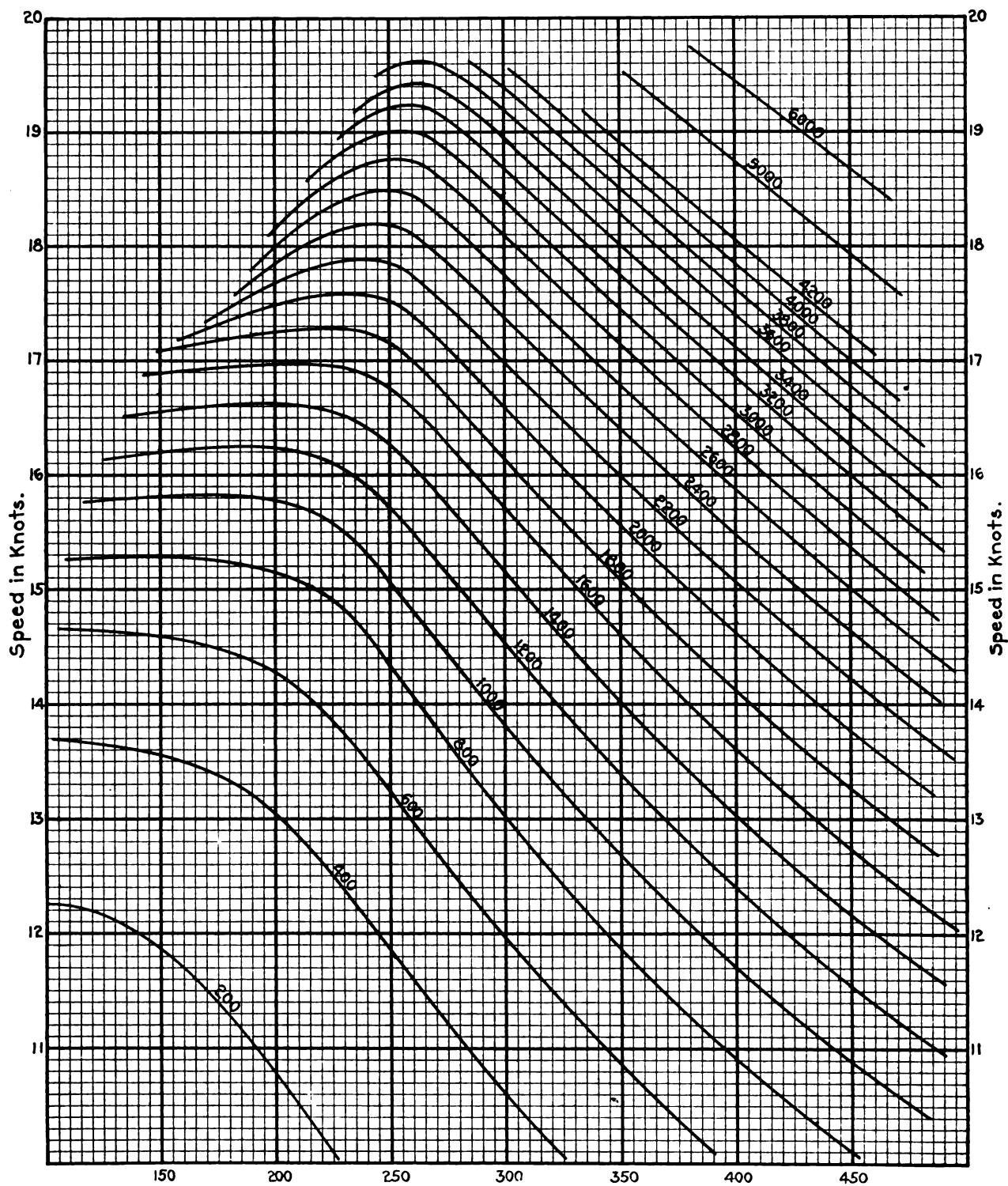
Length of Vessel on L. W. L.

Midship Section Coefficient = .87 to .93

Longitudinal Coefficient = .56

Displacement Length Coefficient = 100

Fig. 3.—Curves of Effective Horsepower for Vessels of Fine Underbody



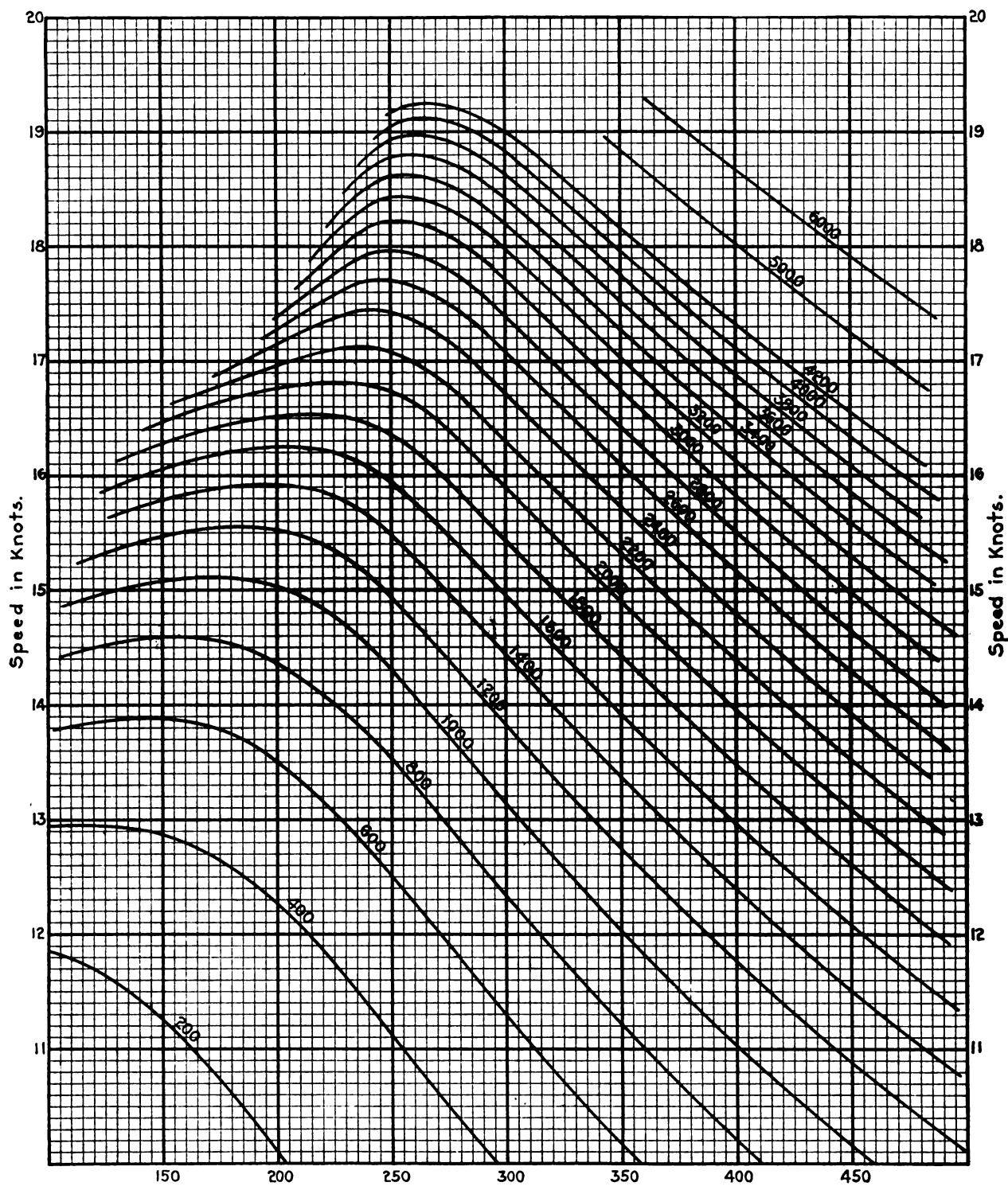
Length of Vessel on L. W. L.

Midship Section Coefficient = .87 to .93

Longitudinal Coefficient = .56

Displacement Length Coefficient = 125

Fig. 4.—Curves of Effective Horsepower for Vessels of Fine Underbody



Length of Vessel on L. W. L.

Midship Section Coefficient = .87 to .93

Longitudinal Coefficient = .56

Displacement Length Coefficient = 150

Fig. 5.—Curves of Effective Horsepower for Vessels of Fine Underbody

form of the vessel contemplated and the forms upon which the curves are based.

Taylor's standard series curves were based upon a form having high floored or V sections forward and aft with a straight stem and cruiser stern. Most of the forms utilized in preparing the curves in hand are of similar type, but it is believed that the curves are applicable with fair accuracy to vessels with fantail and transom sterns, provided the floors of the sections right aft have a sharp rise.

Fast vessels (with values of $\frac{V}{\sqrt{L}}$ greater than 1.1) having suitable forms of flat stern may be expected to show a con-

siderable saving in power over that as given by the curves.

For somewhat slower vessels a carefully worked out cruiser type of stern (particularly if the load waterline aft be much broadened and the floors flattened so as to secure the greatest lengthening effect upon the vessel's form) is of advantage and should show better results than those taken from the curves.

The use of a bulbous forefoot, such as is fitted in many United States war vessels, is of advantage, provided the draft is great and the speed insufficient to force the forefoot close to the surface when under way. The curves as drawn do not contemplate the bulbous forefoot.

60-Ton Self-Propelling Floating Crane

**Counterbalanced by Ballast Weights and Controlled
from Cabin Placed on Top of the Crane Framework**

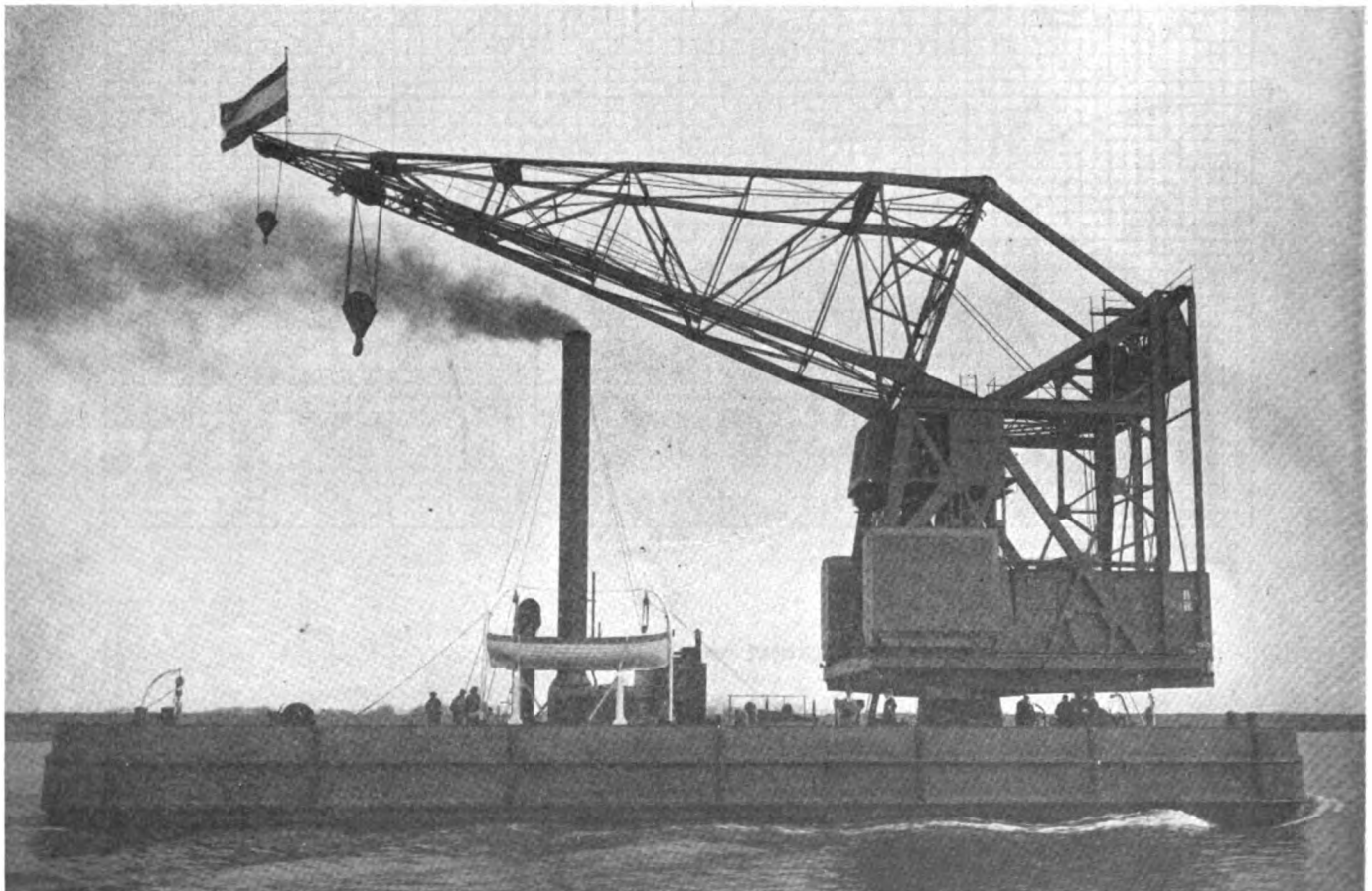
DURING May, 1921, a 60-ton self-propelling floating crane was delivered by the Werf Gusto. Firma A. F. Smulders, Schiedam, Holland, to the Manchester Ship Canal Company, Manchester, England. The crane is of the "Gusto" slewing and derricking type and is provided with two blocks, one capable of working with loads up to 60 tons and the other for loads up to 10 tons, both so arranged that each can deposit heavy loads on its own pontoon. The loads are counterbalanced by two travelling ballast weights. By means of the latter the pontoon of the crane will remain practically level athwartships while lifting with all loads up to 60 tons.

The maximum height of hooks for the main and auxiliary

hoists from the water level at the lowest position of the jib is 65 feet. The hoisting ranges are 75 feet and 120 feet respectively. The maximum radii of the hooks are 60 feet and 76 feet, respectively, corresponding with a distance of 32½ feet and 47½ feet, respectively, clear of the pontoon. The jib can be lowered so that the highest point of the jib is not more than 73 feet above the waterline.

The hoisting speeds are 7 feet and 40 feet per minute, respectively. At the trials a complete revolution with the full load of 60 tons on the main hoist was made in about two minutes.

All the movements of the crane are effected by electric motors of which there are seven in all which are placed in



"Gusto" Slewing and Derricking Crane Built for Manchester Ship Canal Company

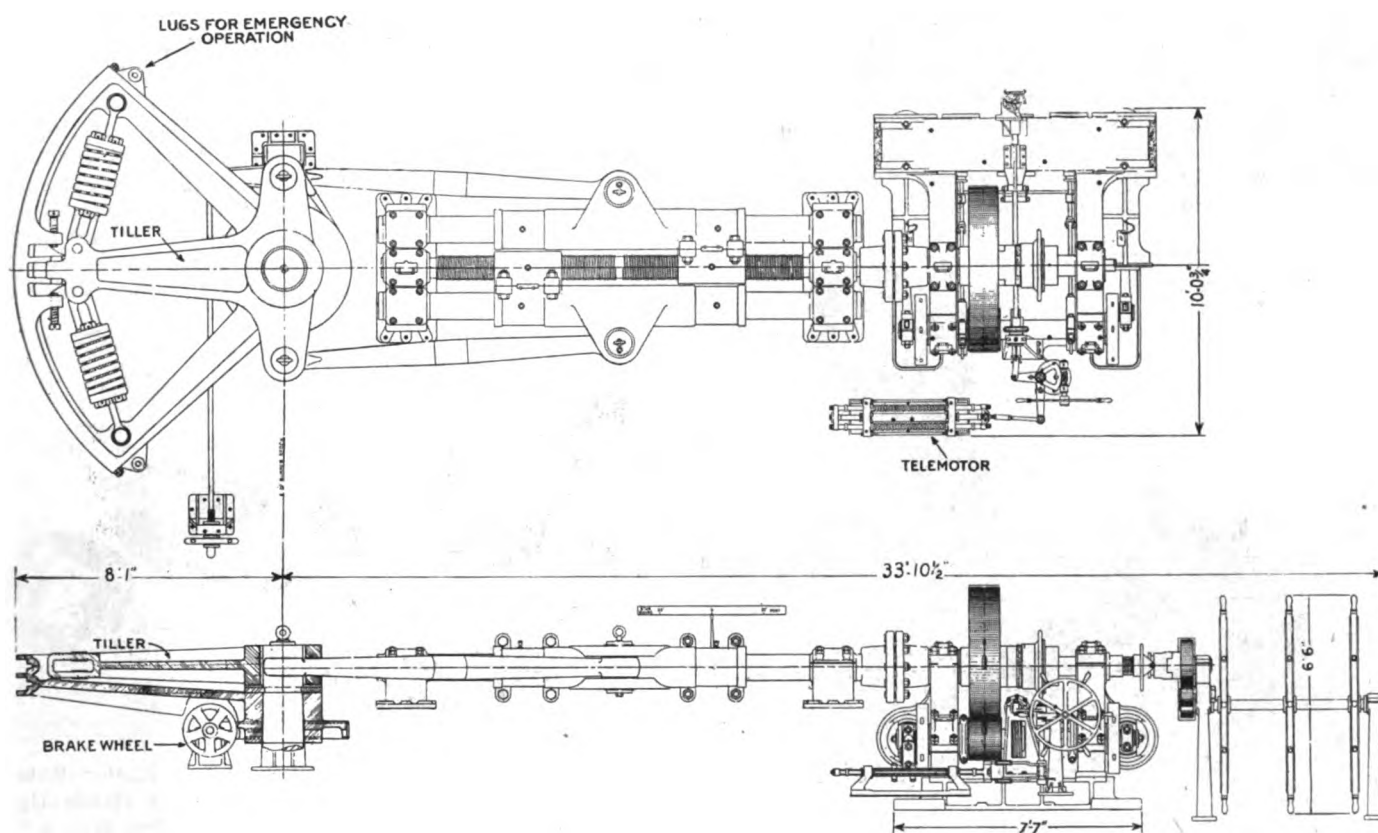
the winchroom, situated on the lower platform of the crane tower. The various movements are controlled from the cabin placed on top of the crane framework and the driver, having a clear view not only of the weight being lifted but also of the deck of the pontoon, is able to observe the progress of the work. In front of the driver are the controllers with which he can control any of the motors he requires to effect any desired movement of the crane. In this cabin are also placed the various instruments and gages, including the apparatus for controlling the inclination of the vessel and an indicator on which the position of the jib at any moment can be seen, as well as the distance of the hooks from the center of the tower.

Only one man is required in the control cabin for working the crane. This simplicity of handling is made possible by connecting up the electrical installation by the Ward Leonard

Combined Screw and Spring Quadrant Steering Gear for Combination Ore Vessels

THE steering gears for use in the 20,000-ton ore-and-oil and ore-and-coal vessels under construction by the Bethlehem Shipbuilding Corporation, Ltd., are being built at the Moore plant of the corporation at Elizabeth, N. J. Four of the vessels, the ore-and-oil carriers, one of which is for the International Petroleum Company, Ltd., and three for the Ore Steamship Corporation, are being constructed at the Sparrows Point, Md., plant; the other two, designed for carrying ore and coal for the Ore Steamship Corporation, are building at the Union plant, San Francisco, Cal.

The steering gear, which is the same design for all six



Plan and Elevation of Combined Screw and Spring Quadrant Steering Gear

system, which enables any load to be lowered or hoisted at extremely low speeds as well as providing many other advantages.

Numerous safety devices are provided, such as electric brakes to all the motor shafts, devices to limit the working range of the various movements, also for guarding against a too heavy electric current.

The dynamos for supplying the current are driven by one of the compound propelling engines. The machinery for the propulsion consists of two sets of vertical compound engines with an independent surface condensing plant.

At the trial trip on the river Meuse a speed of nearly $5\frac{1}{2}$ knots was attained.

There is a very complete equipment of deck machinery and an extensive electric light installation is provided for the pontoons and crane.

The deck aft in the path of the radius of action of the crane is free of all obstacles and especially strengthened so that any heavy weight may be placed on it.

The crane was towed from Schiedam to Manchester without the jib being dismounted.

vessels, consists of a Bethlehem standard 16-inch by 12-inch screw steering gear direct connected to the rudder stock through a spring quadrant and tiller, as shown in the illustration. The tiller is free to turn on the rudder stock and is operated by the connecting links of the screw gear. The quadrant, keyed to the rudder stock and connected to the tiller by two heavy springs, transmits the power to the rudder. All shocks between the rudder and engine are taken by the quadrant springs, which are so arranged that they are both in compression at the midship position and, therefore, instantly transmit any movement of the quadrant and screw gear to the rudder stock. This combination provides an extremely powerful gear with the added advantage of transmission through the shock absorbing springs.

For ordinary operation the steering engines are controlled by hydraulic telemotor. A trick wheel, on the same deck as the engines, provides means for control when adjustment of the telemotor is required. For docking purposes the valves of the engines can also be controlled from a steering column located on the engine and boiler room casing and connected up through shafting and bevel gearing. For hand-

steering the engines can be disconnected and the screw operated by three 78-inch hand wheels located at the forward end of the gear.

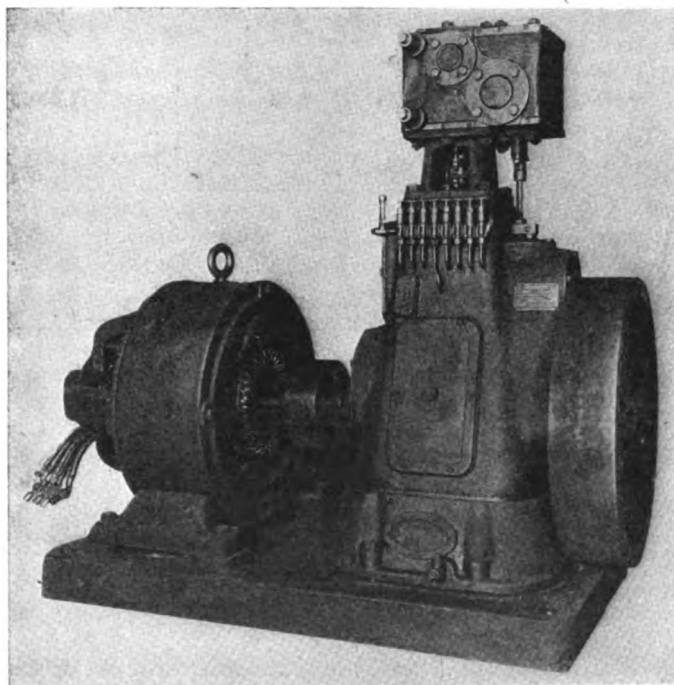
Arrangements are also made for relief steering from a steam winch located on the poop deck. The quadrant is grooved to take chains which are operated from two winch heads by means of relieving tackle carried through deck leaders to the steering gear room. The quadrant, being keyed to the rudder stock, operates the rudder direct.

For emergency steering, lugs are fitted to each side of the quadrant and the rudder stock can be operated by hand through cables attached to the lugs.

Light Weight Engine Generator Set for Marine Auxiliary Service

AUTOMATIC lubrication, elimination of practically all vibration, low piston speed, sparkless commutation and improved voltage regulation are features of a new type auxiliary engine generator unit known as the Westinghouse-Sturtevant marine lighting set.

The engine frame for this unit is oil and dustproof and provided with large openings having cast iron covers located so as to give ready access to all parts subjected to wear. The



Westinghouse-Sturtevant Lighting Set

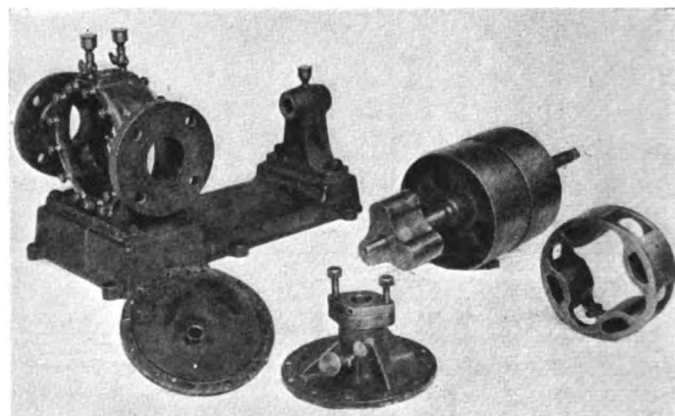
oil reservoir for the lubricating system is cast in the top of the frame. In the distance piece, separating the cylinder and the frame, are enclosed a watershed partition and stuffing box together with the piston rod stuffing box. The cylinder is of close grain iron cast in one piece with the valve chest. Relief valves of large diameter which may be adjusted to open at any desired pressure are fitted into the cylinder. The steam valve is of the piston type and operates in a renewable bushing which forms the valve ports. The engine is equipped with an inertia governor of the Pites flywheel type. The piston is of cast iron cored for lightness. The crank shaft is of open hearth steel made in a single forging fitted with balancing counterweights secured to the webs. The lubricating system is automatic, requiring no independent tank or reservoir. In engines having gravity type lubrication the oil is pumped from the reservoir in the base by a chain driven rotary pump to the upper reservoir cast in the top of the

frame. In the case of engines equipped with a forced feed system of lubrication the submerged pump forces the oil under pressure through brass pipes direct to all parts requiring lubrication.

The Westinghouse type "S-K" generator forms part of the set. The frame for this machine is forged from open hearth steel. The bearing on the generator is a solid steel shell lined with babbitt metal so constructed that no leakage of oil will occur with the listing of a vessel. Both armature and field windings are impregnated with a special compound for resisting the moisture and salt atmosphere found in marine service. By the application of commutating poles, sparkless commutation has been obtained.

New Principle Adopted in Constructing the Exeter Rotary Pump

THE rotary pump (Feuerheerd patents) produced by the Exeter Machine Works, Inc., West Pittston, Pa., is based on a new idea of rotary pump construction, the underlying principle of which is a variation of the square hole drilling device in which a triangular body functions inside a restraining square former of equal size. In the pump this combination has been developed as a three-toothed gear having the teeth made up in the form of circular arcs meshing with an internal four-toothed gear set eccentrically. As the two gears rotate irregular spaces are formed which as



Parts Making Up One 4-Inch Belt Driven Exeter Rotary Pump, Capacity 215 Gallons Per Minute, on Heads Up to 300 Feet at a Speed of 500 Revolutions Per Minute

they increase and diminish in volume are utilized to pump and eject the fluid.

In detail the pump consists of an outer casing of cylindrical form which contains two rotors, the inner one of which is keyed to the driving shaft. The outer rotor has four ports which are open to both the suction chamber and the discharge chamber during rotation. Cut-off between the suction and the discharge sides of the pump is accomplished by a lip at both the top and bottom of the pump body which closes the ports momentarily. The liquid is drawn into the pump through the ports of the outer rotor while the space between the internal and external gears is increasing in volume and forced out of the opposite side of the pump during the last half of the revolution when the pocket is decreasing. The rotors themselves are flat castings with the sides in parallel planes. The edges are cut in the form of circular arcs as shown in the illustration. The outer rotating member is a working fit in the body casting at its periphery but is free otherwise, the inner rotor imparting motion to it.

The pump is self-priming and is adapted for boiler feed, circulating, ballast or lubricating work and for handling oil, bilge water, gasoline and the like.

Progress of Shipping Legislation

ALTHOUGH a majority of both the House and the Senate will undoubtedly support the bills introduced for the purpose of repealing the Panama Canal tolls affecting American ships, it is known that President Harding believes that this object can be accomplished in a more satisfactory manner through diplomatic channels. In fact, the President has stated that such negotiations have already been started. Considerable opposition is expected to develop at the public hearings on these bills, particularly from the railroads as the steamship companies operating through the canal have already taken considerable business from them. Great Britain and other maritime countries are also expected to protest that such legislation is in violation of existing treaties.

The Senate has reached an agreement to take a final vote on Senator Borah's bill which provides for free tolls for American coastwise ships on October 10.

Senate bill (S. 2265) relating to a model marine insurance law for the District of Columbia, which it is hoped that the several states will copy, has been favorably reported by the Senate Committee on Commerce. This bill is practically identical with the one (H.R. 6775) now pending before the House. The importance of marine insurance to our shipping is discussed in an article appearing on page 663 of this issue.

In spite of the fact that the Administration and Congress have indicated that they favor private ownership and operation for shipping, a bill is now before the House Committee on Merchant Marine and Fisheries which would place the Panama Railroad steamship operation and army transport vessels under the Shipping Board. In addition to this the Secretary of the Interior in a bill, the title of which reads: "A Bill to Provide for the Consolidation or Redistribution of the Powers and Duties of the Several Executive Departments of the Government of the United States Relating to the Territory of Alaska and for Other Purposes," has included a section directing the Shipping Board to transfer to the Secretary of the Interior the ships necessary to establish a steamship line between Alaska and the United States which is to be operated by the Department of the Interior.

Senator Frelinghuysen has introduced a bill in the Senate providing for the use of the Shipping Board's wooden ships for a pontoon bridge from Yonkers across the Hudson. It is understood that the President and the Secretary of War have no objection to using the wooden vessels for this purpose so long as the War Department has supervision of the construction. About fifty vessels will be needed for this purpose but no appropriation will be required of Congress. The construction is planned to permit the free passage of small craft but a draw will be built for the larger vessels. The bridge would be built by a private corporation and tolls would be charged.

Senator La Follette has introduced in the Senate a resolution (S. Res. 113) in place of (S. Res. 90) which he had previously introduced, authorizing and directing the Committee on Commerce to investigate the wage controversy between the Shipping Board and private shipowners and their employees and into the causes and the claims and contentions of the respective parties and their merits. This investigation is entirely superfluous at this time and it is only another means of attracting undesirable notoriety for our shipping.

The public hearings on Congressman Edmonds' bill to amend the Seamen's Act will be attended by a committee from the American Steamship Owners' Association. They

will urge that the proposed amendment to the La Follette Act shall include the recommendations on the revision of our maritime laws presented by the committee headed by P. A. S. Franklin. This committee was appointed about two years ago but no action has been taken on its recommendations.

A bill authorizing the Secretary of the Navy to investigate and receive claims of contractors has been reported by the House Committee on Naval Affairs. Such matters as reimbursing contractors and sub-contractors for actual losses under fixed price contracts during the war when such losses have been caused by the action of the Government agencies may be filed with the Navy Department within 60 days after the approval of the bill. The bill also legalizes certain written promises of the Secretary of the Navy on the authority of which contractors have made expenditures.

Senator King has introduced a bill in the Senate providing for cessation of work on the major portion of the 1916 naval program. The bill would stop the construction of capital ships and convert two of the battle cruisers into aeroplane carriers. It would order the immediate construction of four new fleet submarines. In spite of the recommendations of high naval authorities all over the world there is a decided effort now being made to create the impression on the public mind that the aeroplane is superior to ships of the line. The recent bombing tests conducted by aeroplanes have done much to support this effort notwithstanding the fact that the same arguments apply to torpedoes and torpedo boats which failed to make battleships obsolete. Aircraft should be met with aircraft as torpedo boats were met by destroyers. A plane that must go a long distance with only one or two shots in its locker must look out for the faster plane equipped with machine guns.

Great Lakes Commerce Through Sault Ste. Marie Canals During July*

		East Bound	
Articles	U. S. Canal	Canadian Canal	Total
Lumber, M. ft. B. M.....	35,754	660	36,414
Flour, barrels.....	630,500	488,640	1,119,140
Wheat, bushels.....	6,377,308	1,500,769	7,878,077
Grain, other than wheat, bushels.	6,730,926	4,108,100	10,839,026
Copper, short tons.....	1,753	.....	1,753
Iron Ore, short tons.....	4,356,760	.....	4,356,760
Pig Iron, short tons.....	.....	.....	.....
Stone, short tons.....	800	2,160	2,960
General Merchandise, short tons	8,408	4,062	12,470
Passengers, number.....	3,796	6,804	10,600
		West Bound	
Coal, soft, short tons.....	2,469,430	17,560	2,486,990
Coal, hard, short tons.....	445,754	.....	445,754
Iron Ore, short tons.....	.....	.....	.....
Mgd. Iron and Steel, short tons	4,011	639	4,650
Salt, short tons.....	5,165	508	5,673
Oil, short tons.....	52,012	.....	52,012
Stone, short tons.....	50,013	.....	50,013
General Merchandise, short tons	45,511	36,080	81,591
Passengers, number.....	3,849	7,691	11,540
		Summary	
Vessel Passages, number.....	1,449	613	2,062
Registered Tonnage, net.....	4,503,414	460,730	4,964,144
Freight—			
East Bound, short tons.....	4,832,797	179,103	5,011,900
West Bound, short tons.....	3,071,896	54,787	3,126,683
Total Freight, short tons	7,904,693	233,890	8,138,583

*Compiled at St. Marys Falls Canal, Michigan, under the direction of Colonel E. M. Markham, Corps of Engineers, U. S. Army.

WILLIAM L. BULL, of Baltimore, Md., formerly general manager of the Baltimore Oceanic Steamship Company, has been appointed assistant to W. J. Love, vice-president of the Emergency Fleet Corporation.

Random Notes By An Old Seaman

Why Beauty of Outline and Proportions Should Not be Disregarded in Naval Architecture

By Captain R. E. Barry

WE were once a race of seamen but now the mass of the people know little of the sea or shipping. Artists paint, and photographers produce by retouching, pictures of vessels which are a source of ridicule to the seaman. Prints and photographs of notably beautiful buildings may be found in most libraries and art stores, and colleges devote most of the time to the art end of architecture as distinct from the mathematical or engineering end, but how many beautiful vessels are known even by name?

Perhaps this lack of public sympathy has resulted in the idea that anything that will float and pay dividends is a satisfactory ship, but there seems no reason why grace and beauty should not be considered a factor in naval architecture. The worst offender in this line seems to be the Shipping Board which has designed some of the most hideous vessels afloat and has given names to the passenger vessels to suit their appearance.

Some of the west coast builders have turned out very fine looking tramps, but it is England and Germany that have designed the handsomest mail boats and sailing ships, and certainly Watson showed the world how to design steam

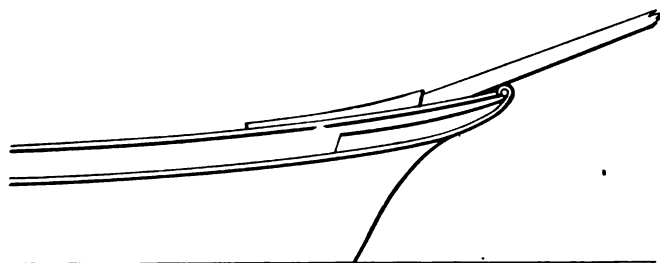
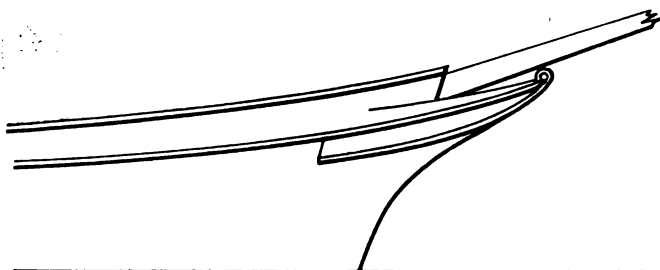
ing plates are easily fitted, as was the custom in old days under the pintles of sailing ships.

SHEER

Denny and most of the foreign builders use a parabolic formula for the sheer, modified for the fullness of bow and crown of deck at the stern. The stern generally is given a rake forward of one in sixteen with a parabolic curve having a maximum offset of two to three inches one-third of the distance above waterline. Watson has produced the most beautiful clipper stems in which the knight heads are in a line tangent to the stem at the waterline.

A rather handsome flare has been given to the bows of most of the vessels built in the last few years, but the stem has often been straight and therefore has appeared hollow.

Very few good sterns have been built in the last few years. A slightly hollow counter is necessary to prevent the stern from looking fat. Generally, if the length of the counter and the part above the knuckle are about equal and the angular



Figs. 1 and 2.—Watson Type Bows

yachts (see Figs. 1 and 2). Sir Edward Harlan spent much time over the profiles of the White Star steamers, and the *Olympic* carries a fourth and dummy funnel merely to balance the profile.

To the old sailor a few things are essential to beauty in ships. Fair curves, generally parabolic, certainly not straight lines running into circular arcs, an appearance of suitable buoyancy, with good sheer, the high bow balancing the broad stern and a balance of spars, funnel and houses that will not give a silhouette in imitation of the skyline of New York City will help much.

The old fashioned screw aperture which reached up to the tuck line is happily a thing of the past, but with some of the new type of rudders large gaps are left between the rudder and post and the effect of patch work is not pleasing. Fill-

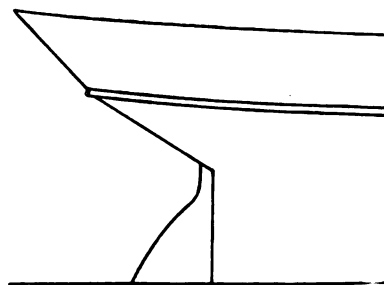


Fig. 3

change in direction not too great, the effect will be pleasing (see Fig. 3).

The half round at the knuckle is not artistic as it is not in the plane to suit the eye. Moldings as shown in the sketch will be effective and cost but little more. In one large vessel this work was fitted in wood, then taken down and used as patterns. Cast iron moldings were then fitted on the ship and calked.

RUDDERS

Where a rudder with integral stock is fitted it is much neater to fit the head of the stern frame with a cant forward, as in the sketch, than to fit the usual patch plate at the bottom of the rudder trunk for purposes of unshipping. If the sides of the transom are swung slightly aft, the periphery will come about in a vertical plane (see Fig. 5).

With the rudder separate from the stock some builders have made a vertical joint in the fore and aft plane which does not in any way mar the profile.

In large twin screw vessels the rudder could well be faired into the lines of the ship, the displacement increased with easier lines, and the facility for riveting about stern post increased (see Fig. 6).

One very pleasing feature of late designs is the elimination of the Lake type steamers with machinery in the stern. This class is suitable only for oil tankers or special types on very short runs in special trades. The master of the *Georgetown*, a lake built "stem winder," used to say that he could only try

for a soft spot on the beach, if caught light in an easterly blow.

OUTSIDE APPEARANCE

The outside of many steamers is made unsightly by streams of dirty water running down the side from the various scuppers. A few large cast steel scuppers discharging below the waterline would improve appearances, give heart to the mate

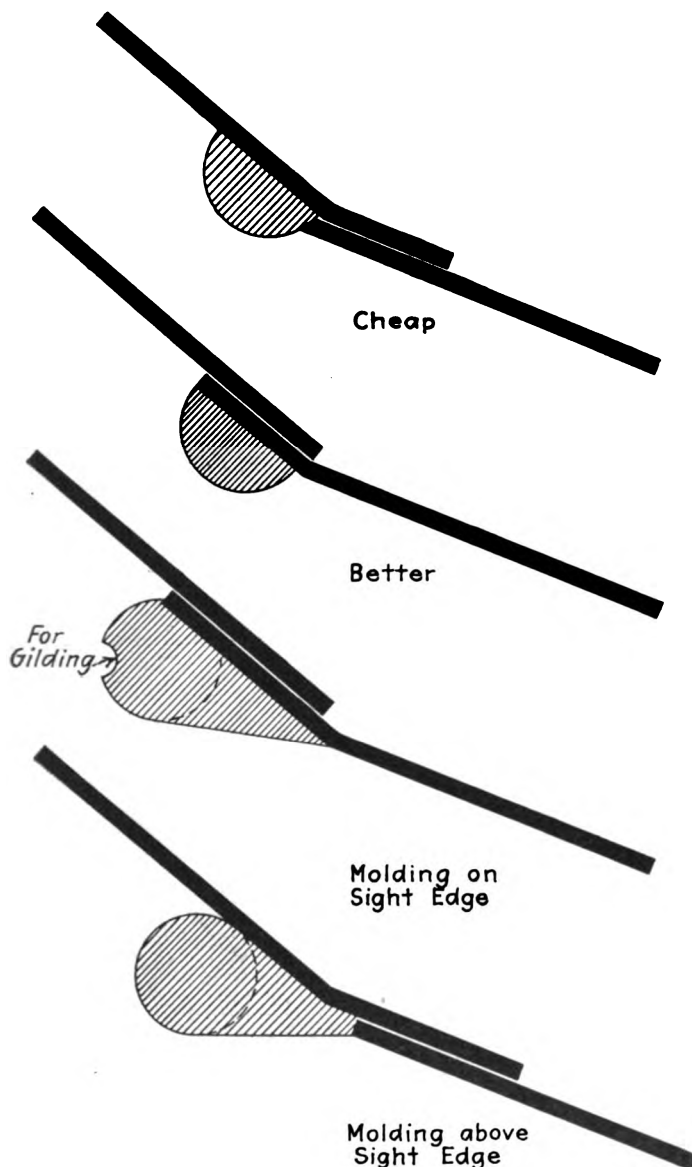


Fig. 4.—Moldings on Knuckles

and prevent loss of much time scaling and painting, probably enough in a year or so to pay for the longer scuppers.

Another thing which causes much annoyance is the exhausting of the anchor windlass engine to the atmosphere. On a cold day the steam often obscures the view from the bridge and the infernal noise prevents the mate on the fore-castle head from hearing any order from the bridge.

The modern system of fitting the circulating discharge well above the load waterline has been the cause of much trouble and damage to cargo on docks, and a source of constant rows between the master and dock superintendent. The plates supposed to prevent the water getting on the dock are generally useless. While Lloyds advocate placing all discharges above the load waterline the suction is below and the factor of safety of a submerged discharge would be no less. Also some of the work done in elevating the circulating water is lost be-

cause the small engines of the circulating pumps are generally very inefficient.

Hinges on side ports were in the old days often a nuisance, causing a delay in docking, when the tide held a vessel to the corner of a dock and tugs could not breast the ship off. Also rims of port lights should not project as they will be broken or bent by docking. Again there is no need of any projections on the side of a ship for gangway grating, as

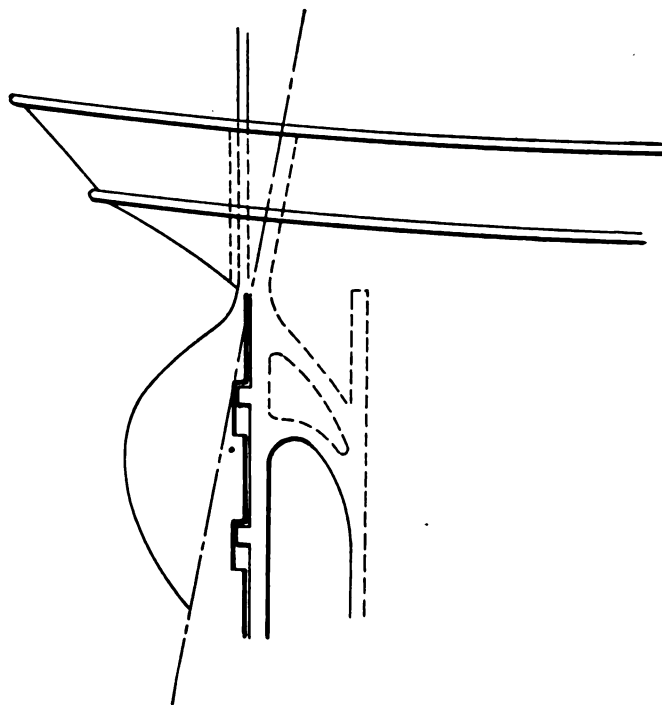


Fig. 5.—Head of Stern Frame Canted so Rudder May Be Unshipped Without Large Hole in Shell

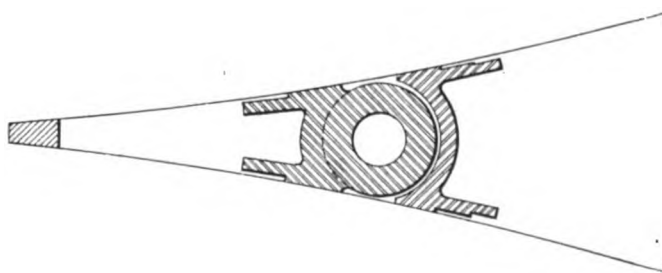


Fig. 6.—Type of Rudder for Twin Screw Steamer

hinges can well be fitted inside the sheer strake and the strut foot held by a chain span from the deck.

RAKE OF MASTS AND FUNNELS

In connection with sheer it is logical to rake the masts, otherwise the foremast will cant forward relative to the deck line and appear anxious to go over the bow.

If the foremast is aft of a normal to the line of sheer at its foot with a rake of at least half an inch to the foot and the other masts and funnels increase their rake by an eighth of an inch to the foot, a stiff gaunt appearance will be avoided. The Cunard, White Star and North German Lloyd steamers have a large rake to their spars and funnels and some of the Atlantic Transport vessels were also fine examples having four masts with increasing rake. The old *Egypt* of the National Line was probably one of the handsomest vessels in the Western Ocean trade. She had a flush deck, a stem raking slightly forward, four masts, one funnel and very few deck houses.

About fifteen years ago large cross trees came into vogue. Those responsible probably had their seagoing experience in

a stone quarry and thought that ship's booms ought to swing the same as derricks do at home. But swinging booms take two or three times as long to handle cargo as do two fixed booms. Also, if the ship listed, there would be trouble with the swinging boom. If the boom guys are properly fitted and led, there is no reason why the point of support of topping lift should be within ten or fifteen feet of a perpendicular through the heel of the boom, therefore the cross trees are useless and only a source of head wind resistance and weight. They certainly are an eyesore.

BOOMS

The large tables fitted to masts often seem to be used more for holding the lead blocks than to shorten the booms. In this case the required lead from the mast can be obtained by canting the winch, and it is often desirable so to cant them that leads can be made direct to the mooring pipes. I wish builders would fit guards to prevent the falls getting into gears due to the carelessness of longshoremen.

It seems a shame to fit the large number of derrick posts seen on some modern vessels as four masts can work eight hatches and, if required, work both sides in the stream.

The Pacific coast method of using the outboard fall as a runner on the inboard with one man handling both winches is an improvement of great merit. But on the coast the vessels carry their own winchmen.

DECK HOUSES

A generation ago while the influence of the sailing ship was strong in the design of steamers, the amount of deck house was limited to a chart house with bridge above, but since the bridge house has become a coal bunker and in the oil burners a cargo space, the quarters have been placed above, with the master's room above the quarters and the wheel and chart house above that, and the standard compass on top of the wheel house with a fence built around it. The resulting windage is large, especially in the smaller ships. One small steamer with erections only twenty feet fore and aft required about two hundred and fifty extra horsepower to drive the excess erections nine knots in a twenty mile breeze. The model of the *Mauretania* required an increase of twenty percent in power to drive the structure added to represent deck houses. Owners pay to test models and to get extra economical machinery and then waste the gain by excess windage. I would never stow booms on end, fit cross trees, or make funnels circular when an elliptical section would answer, or put uselessly high houses on a steamer with fuel costing what it does today. I appreciate the comfort of a high bridge but believe a compromise should be made, especially in the smaller boats.

The average seaman wants an open bridge from side to side with the wheel house set back some five feet. The man who wants to stand inside can do so, but an interrupted bridge is very awkward near land and merely limits the movements without any advantage.

In large modern steamers where there is a variegated skyline the erections can well be normal to the base line, but in small vessels the houses, ventilators and stanchions should follow the yachting rule and be made normal to a mean line between the sheer and the waterline.

A type of house recently fitted above the bridge house is often set back six to ten inches from the side of the ship. This makes a scupper which is hard to clean and is a nuisance. Even if the old type of davits are fitted, they can be fitted inside a canvas watertight collar.

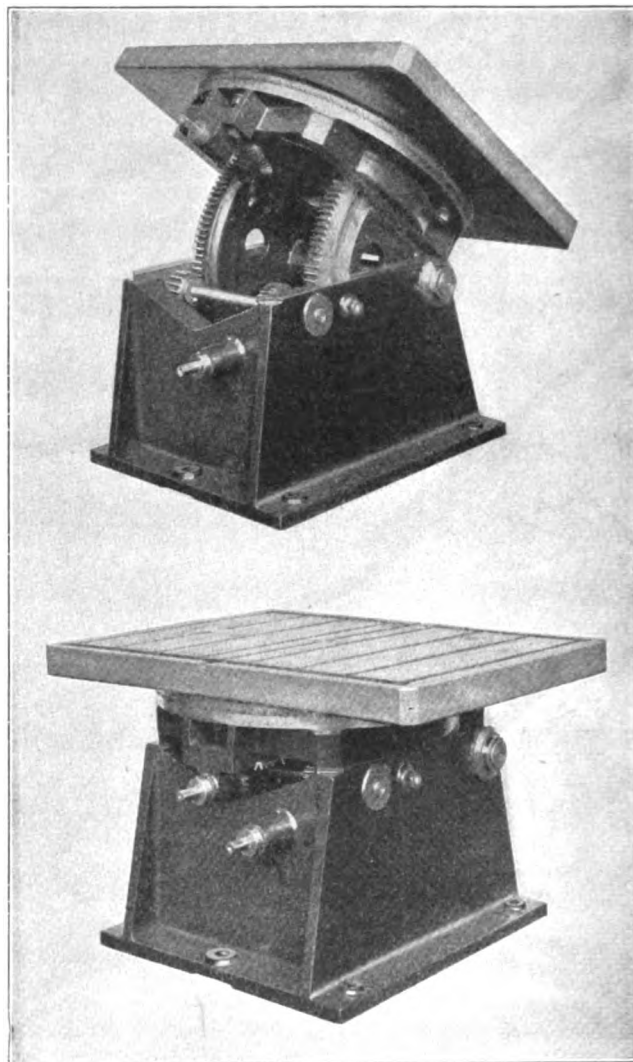
A neatly kept waterline is a great help to appearance, but where it is left to the crew to touch up, it gradually becomes out of line and blurred. The *Gascony* had a plate sight edge at the upper edge of the boot topping and thus saved time in painting both afloat and in drydock.

Crews' water closets have been a source of much trouble.

A cast iron trough say twelve feet long with a roll rim should be fitted with six to ten inch discharge pipes or at least of sufficient size to pass a jumper or a whiskey bottle, and the water should never be shut off. The rim should roll in.

Tilting and Rotary Table for Use with Boring and Drilling Machines

AS a means of speeding up work and reducing machine shop costs a new work table for use with floor type boring, drilling and milling machines, known as the Universal tilting and rotary table has recently been put on the market by the Pawling & Harnischfeger Company, Mil-



Universal Tilting and Rotary Milling Table in Closed and Open Positions

waukee, Wis. This accessory makes it possible to carry out machining operations on five sides of a piece and at any angle with but one set up. The table has an elevation of 90 degrees and can be revolved through 360 degrees in any position, flat or elevated.

There is a graduated dial placed in a convenient position so that the operator may locate the work accurately. The table top is elevated by means of two coarse pitch spur gear segments driven by means of a worm and pinions; and it is revolved independently by a bevel gear and pinion. One revolution of the ratchet handle turns the table 30 degrees and one revolution of the elevating handle elevates the top $2\frac{1}{2}$ degrees.

The Selection of Propelling Machinery

Discussion of Factors Governing Choice of Most Suitable Machinery — Results Obtained With Various Types

By Professor Lawrence B. Chapman*

CONSIDERABLE difference of opinion exists today on the proper type of machinery to use for ship propulsion. The installation to give the most economical performance in service does not necessarily mean the one showing the lowest fuel consumption, for hand in hand with a study of fuel consumption must go a study of first cost, depreciation, cost of maintenance, space occupied, possibilities of breakdown and general feasibility of the installation as a whole. As an example, a case is on record where a quadruple expansion (land installation) showing excellent fuel consumption was replaced by another engine because of the high overall maintenance cost. Here is a case where the low fuel consumption was outweighed in actual practice by other considerations.

Another point that should not be overlooked is the interrelation of the efficiency of the power plant with the operating efficiency of the ship as a whole. Obviously, if the repairs or overhauling of a particular unit of a ship's power plant, or the ability to obtain a special kind of fuel, prolonged the ship's stay in port over that necessary for discharging and loading the cargo, it would be poor judgment to install such a unit or adopt the particular fuel, no matter what gain in fuel economy resulted. For a slow or medium speed cargo ship the fuel cost is not a large proportion of the total operating expenses; and hence a reduction in fuel consumption should not be accomplished at the expense of some more important factor in the operating charges.

The power plant and fuel have another relation to the ship, as a whole, in that they both affect the cubic feet of cargo space, the tonnage measurement and the net deadweight capacity. A reduction in steam consumption is accompanied by a reduction in the size (and cost) of the boilers, piping and auxiliaries and bunkers which in turn increases the carrying capacity of the ship. So complex is the problem that no exact solution is possible—the best that can be done is to give proper weight to all the factors involved.

The tendency in the past has been too conservative in regard to innovations and improvements in a ship's power plant. There has been some justification for this, for if troubles arise with new types of machinery at sea, the engineer cannot call on the manufacturer for help and assistance, as in a land installation, but must make his own repairs and solve his own problems. Further, when a ship is at sea the superintending engineer does not have access to the plant as in a land installation and the chief engineer is thrown absolutely on his own resources. During the war marked advances were made in marine engineering; much of the conservatism has been swept aside and many things almost impossible a few years ago are today generally adopted. Still there is a great deal of conservatism left among shipowners as the failure to adopt Diesel engines bears witness.

TYPES OF PROPELLING MACHINERY AVAILABLE

In the selection of machinery for a merchant ship, we have the following types from which to choose:

1. Triple expansion reciprocating engines.
2. Quadruple expansion reciprocating engines.
3. Direct connected turbines.
4. Combination machinery—triple expansion engines and a low pressure turbine.

5. Geared turbines.
Single reduction 1:5 to 1:10.
Double reduction 1:25 to 1:35.
6. Electric drive.
7. Diesel engines
(a) two or four cycle.
(b) solid injection; air injection.
8. Diesel electric drive.
9. Still engine—combination steam and Diesel.

All of these types have virtues and defects and a selection cannot be made on a few points alone. Many comparisons of the above types have been published from time to time, and I will not attempt to go into a general comparison in detail by pointing out the merits and drawbacks of each.

FACTORS INFLUENCING SELECTION

The important factors involved in a selection are:

1. Revolutions per minute and propeller efficiency.
2. Fuel consumption.
3. Weight and space occupied.
4. Capital charges, including maintenance, repairs and depreciation.
5. General reliability.

For a low speed cargo ship of moderate power, high propeller efficiency requires low revolutions per minute. With the exception of the direct connected turbine, all the types mentioned can be designed for revolutions from 80 to 130 per minute.

With direct connected turbines the high revolutions per minute necessary for good turbine efficiency, reasonable weight and size are detrimental to propeller efficiency; hence this type of machinery has practically disappeared from ship propulsion and will not be considered here.

RECIPROCATING ENGINES

The merits of the triple and quadruple expansion engine are well known and need receive no attention here. The quadruple expansion engine shows better economy than the triple expansion engine, but its first cost is greater and it requires a longer fore and aft space; thus, while there is a reduction in annual coal bills and a reduction in bunker and boiler space, there is a loss of cargo space on account of the longer engine room required and an increase in capital charges due to greater first cost of the engine. Unless the ship is of sufficient size and the voyage long enough to show a fair increase in annual profits due to reduction in fuel costs and bunker and boiler space as offset against increased capital charges and loss of cargo space due to length of engine, the quadruple expansion engine is not to be recommended. As a rule the four cylinder triple expansion engine is to be preferred in place of a quadruple expansion engine.

Combination machinery at one time offered great possibilities in reduced steam consumption and would no doubt have been widely adopted except for the introduction of the geared turbine. This type of machinery consists of a three screw arrangement with reciprocating engines on the wing shafts, exhausting to a low pressure turbine on the center shaft. The steam consumption of this arrangement is nearly as good as that of the geared turbine. This is due to the high efficiency of the reciprocating engine at high pressures and of the turbine at low pressures. The two noteworthy installations are the steamships *Otaki* and *Rochambeau*. The machinery requires a larger space than reciprocating engines, but it was found in the *Otaki* installation that the loss in

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cargo space was offset by the reduction in bunker and boiler space. There resulted a considerable net gain in revenue due to reduced coal consumption.

As already mentioned, the geared turbine has taken the field offered by combination machinery and it does not seem likely that the latter will be used in the future except in perhaps a few cases. In steam consumption, weight and space occupied the geared turbine and electric drives are about the same; they are much lower than corresponding figures for the reciprocating engine.

In view of the fact that the geared turbine and electric drive have so much in their favor over the reciprocating engine, we might ask why the latter should be considered at all. If steam and fuel consumption, weight and space were our only criterion, the reciprocating engine would receive little consideration today. The triple expansion engine, however, is an installation of proven reliability; repairs can generally be made in any part of the world and marine engineers are familiar with the unit. The geared turbine and electric drive, on the other hand, are new and in some respects untried installations. Repair bills and the time lost in overhauling these units when operated by inexperienced crews may more than offset the advantages of lower steam consumption and reduced machinery space.

The four cylinder triple expansion engine with the improvements in design such as were used in the last reciprocating engined ships of the United States Navy has much to recommend it for certain low powered cargo ships such as tramps, on account of the character of the engine room force often available and the possibilities of repairs in out-of-the-way ports. There is no doubt, however, that too many reciprocating steam engines are being installed today, especially with the advantages offered by the Diesel engine.

GEARED TURBINE VS. ELECTRIC DRIVE

From the foregoing it appears that the choice of a steam installation narrows down to the geared turbine and the electric drive. As already mentioned, these two types of machinery do not differ greatly from one another in steam consumption, weight and space occupied. Certainly, the small differences in these factors are not enough to have an influence in the selection of one or the other for a cargo ship. Both can reduce the propeller revolutions down to a reasonable value. The little difference existing is in favor of the geared turbine which can reduce the revolutions per minute down to as low a value as is desired while the lower limit for a motor of less than 3,000 horsepower is about 100 revolutions per minute.* The efficiency is also slightly in favor of the geared turbine, amounting to 95 percent for the double reduction gears against 91.5 percent for the combined efficiency of the generator and motor. However, there is a small loss due to windage in the reversing turbine of the geared installation which reduces the output of this installation. The net result is that the geared installation requires about 2 percent less shaft horsepower than electric drive.* To this should be added a slight possible gain in propeller efficiency, if lower revolutions per minute are adopted with the geared turbine.

Ease of control, reversing and economy at reduced speeds are greatly in favor of the electric drive. Also, due to the fact that the electric drive requires no reversing element, a higher initial steam temperature can be carried which allows greater possibilities in economy by using higher steam pressures and superheat.

The electric drive has been proven beyond all dispute to be the ideal machinery for naval vessels where ease of handling during maneuvering is essential and where good economy at cruising speeds is required. These merits, however, do not appear to be pertinent for merchant ships where

continuous duty at full power and a minimum amount of maneuvering are involved. The claim has been put forward for the electric drive that it eliminates the shaft alley; but this is accomplished only by a reduction in cargo space caused by the motor compartment aft.

During the haste and rush of the war a number of geared installations fell down due to poor workmanship; others failed because of incorrect design due to a lack of experience. Perhaps the largest amount of trouble, and that which has caused such a lot of prejudice and hesitation about adopting geared turbines, has been due to the inefficient handling on shipboard by inexperienced crews.

SINGLE VS. DOUBLE REDUCTION GEARS

With the careful workmanship which is available today, extended experience in design and proper attention to the oiling system after installation, there should be little trouble experienced with this installation. Most of the merchant ships fitted with double reduction gears today are operating perfectly. A recent paper before the Institution of Naval Architects by H. B. Tostevin points out that during the war there were 556 sets of geared turbines in the British Navy, some having been in operation six years. Of these, three were removed for realignment, two were removed and "dressed up" because of noise and slight wearing, two others developed fractured teeth but were not removed. Surely this is a creditable record.

The ships of the British Navy just referred to are practically all fitted with single reduction gearing with reductions between 1:5 and 1:10, the propeller running at 200 to 400 revolutions per minute. While revolutions as high as this give good propeller efficiency with high speed naval vessels, they are not admissible for slow speed merchant ships. Hence double reduction gearing has been adopted in the merchant service.

The British battle cruiser *Hood*, which has just successfully completed her trials, is fitted with four sets of reduction gearing transmitting 36,000 shaft horsepower each.

"From the experience so far gained there is no reason to suppose that gearing should not have a long life, provided that a reasonable amount of care be exercised in running an installation that has successfully passed through its specific tests."—Tostevin (Institution of Naval Architects, 1920).

A fair comparison, however, shows that the geared turbine and electric drive are on a par in most respects and are by far the best choice for steam machinery. If the cost of the electric drive can be made the same as the geared installation probably both will be used in the future. The electric drive no doubt will find favor for some time in merchant ships on account of its reliability until more experience with geared ships overcomes the prejudice and hesitancy now existing. The electric drive in connection with the Diesel engine offers special advantages for small installations and will be taken up later in this article.

As already pointed out, the lower the revolutions of the propeller per minute, the better the efficiency of the propeller. For cargo ships of 10 and 11 knots with about 3,000 shaft horsepower, revolutions per minute of about 90 have been adopted with geared turbines. Revolutions lower than this are even more desirable, if suitable gearing can be secured and the propeller diameter does not become too excessive. We thus see that the introduction of the geared turbine offers low propeller revolutions coupled with light weight as well as low steam consumption. Passenger ships with higher speeds can secure good propeller efficiency with higher revolutions per minute, but even here the revolutions per minute should be kept as low as possible.

The ships of the British Navy are practically all single reduction of between 1:5 and 1:10, the propellers running at 200-350 revolutions per minute. All of the American

*MARINE ENGINEERING, December, 1919, page 817.

cargo ships are double reduction of 1:23 to 1:36, the propellers operating at 90-100 revolutions per minute.

BOILERS

The next point to decide is the type of boiler to use. There are two types open for selection—the well known Scotch fire tube boiler, and the large tube watertube boiler similar to the Babcock & Wilcox and Foster types. The lighter express types of watertube boilers will not be considered here as they are unsuitable for the merchant service. On account of necessity of light weight they are used in all high speed naval vessels.

Both the Scotch and watertube boilers have merits and defects. The Scotch boiler has been almost universally used in the merchant service. All sea going engineers are familiar with it; firemen can easily be secured for operating it; repairs can be made in practically every port of the world; and it has a large water volume and consequently is not dangerous in the hands of an inexperienced crew. These comprise the merits of the Scotch boiler. Its defects and drawbacks are many.

It has a very poor circulation and steam must be raised slowly. As a result of the poor circulation unequal stresses are set up, often causing it to be in a leaky condition and necessitating frequent and expensive repairs. On account of the long time required to raise steam it is particularly bad on short runs, when it is frequently cooled down and heated up. Frequently the time required for cooling, cleaning or repairing and raising steam in a Scotch boiler decides the length of stay in port. Scotch boilers cannot be forced as can a watertube boiler and are apt to be short lived if an evaporation rate in service of much over 5 pounds per square foot of heating service is maintained. Unless the Scotch boiler is fitted with a waste heat superheater and air heaters in the uptakes or is fitted with retarders or given a good length of tube for the same purpose, its efficiency will be less than that of the watertube boiler. This is especially true if the boiler is operated on fuel oil at high rates of combustion.

The watertube boiler has many advantages over the Scotch boiler. It occupies less space, costs less for a boiler of equal capacity, the upkeep charges are lower, and it is much lighter. Further, the watertube boiler can be easily forced without any serious results; steam can be raised quickly and it can be quickly cooled for repairs. Thus a case will seldom arise where a ship's delay in port is influenced by the boilers. As higher steam pressures can be carried with a watertube boiler, this alone may often be enough to decide in favor of this type.

A case is on record where a Babcock & Wilcox boiler was blown down, a tube removed and steam raised again in two hours. In another case steam was raised to 200 pounds pressure from feed at 100 degrees F. in 15 minutes.

In an earlier paper, "The Fuel Problems for Steamships," further advantages of the watertube boiler were pointed out.

From the foregoing statements it would seem that the tradition of the merchant service, its general familiarity and ease of handling with an inexperienced crew are the only things which recommend the Scotch boiler. For the most efficient operation and reduced operating costs of both ship and machinery the watertube boiler should be more universally adopted.

The universal adoption and good service rendered by the watertube boiler in the United States and other navies should be a sufficient recommendation for its use in the merchant service. On account of the great saving and weight, it should be the only type considered for high powered passenger ships.

SPACE OCCUPIED BY MACHINERY

The adoption of improved types of machinery and consequent reduction in the machinery space may lead to a reduction in revenue, and possibly a loss, at a place entirely un-

looked for, namely, in the port and canal dues which are charged against net tonnage. The existing rules for net tonnage measurement allow a reduction from the gross tonnage of 32 percent for the machinery space, provided the actual measurement of this space is above 13 and under 20 percent of the gross tonnage. If this space does not lie between these limits, the reduction is 1.75 times the actual space. With improved machinery and reduced space the percentage might come out 12 percent. In this case the rule allows 12 by 1.75 or 21 percent reduction instead of 32 percent.

Mr. A. T. Wall, who first directed attention to this fact in a paper before the Institution of Naval Architects in 1919, cites the following example: Ship 580 feet by 70 feet by 45 feet with a gross tonnage of 20,000 and fitted with reciprocating engines and Scotch boilers. The space occupied by engines and boilers works out at 14 percent, allowing a reduction from the gross tonnage of 32 percent, or 6,400 tons. With an allowance of 1,350 tons for crew space, the total reduction becomes 7,750 tons. This gives a net tonnage of 12,250 tons. If the same ship is fitted with turbine machinery and watertube boilers, the actual space is 10 percent, which allows a reduction of 10 by 1.75, or 17.5 percent, instead of 32 percent, as before. This results in a net tonnage of 15,150—an increase in net tonnage of 24 percent with an actual gain of only 5 percent in cargo space.

Thus the owner is required to pay tonnage dues on 2,900 additional tonnage by the adoption of more efficient machinery. While the present tonnage measurements are in force it appears that the reduction in space brought about by turbine engines and watertube boilers might result in a loss instead of a gain.

This again illustrates the point that I have previously mentioned—that there are many factors which involve the hull as well as the machinery installation and that a decision as to the most suitable power plant cannot be given until every influencing factor is given its proper weight.

THE DIESEL ENGINE

The superior economy of the Diesel engine over all other types of prime movers is very marked. The fuel consumption of this engine averages about 0.42 pound per shaft horsepower, while the very best performance with geared turbines and watertube boilers is about 0.90 pound per shaft horsepower per hour. With the adoption of high steam pressures, superheat, high vacuum and the most efficient, oil burning watertube boilers and geared turbines, together with the most careful attention to the economical operation of the whole power plant, the fuel consumption for a steamship might be reduced to 0.85 pound per shaft horsepower. A consumption as low as this, however, would be practically impossible to maintain for any length of time in service conditions at sea. The best that can be expected of the steam installation in service is probably about 1.00 pound per shaft horsepower per hour. The Diesel engine, however, can easily maintain a consumption of 0.42 pound per shaft horsepower day in and day out at sea. Hence we can conclude that the best steam installation will have a fuel consumption of between 2 and 2.5 times that of the Diesel engine. This is comparing the very best type of steam machinery with the Diesel engine. If we extend the comparison to coal burning ships fitted with reciprocating engines, the fuel used will run from 3 to 3.5 times that of the Diesel engine.

With the Diesel engine showing this very large reduction in fuel oil consumption, we would naturally expect to see it replacing steam machinery at a rapid rate in new ships; but this is not the case. The Diesel engine has now reached the stage in its development where shaft horsepowers of 2,500 to 3,000 are in successful operation. With twin screws, an installation of 6,000 shaft horsepower per ship is possible today. The revolutions of Diesel engines now in operation in cargo ships range from 85 to 130 per minute.

COMPARISON OF DIESEL WITH STEAM MACHINERY

Diesel machinery has the disadvantage when compared with steam, in that it is considerably heavier and has a higher first cost. It has the advantage in that it occupies less space, requires a much less engine force to operate and, as already pointed out, has a fuel consumption of one-quarter to one-half of that of steam installations.

Unfair comparisons of Diesel and steam machinery have at times been published showing that the Diesel machinery is no heavier and costs no more per horsepower than steam. These comparisons, on closer examination, generally reveal the fact that a Diesel engine with 120 or more revolutions per minute is compared to a steam engine of 90 revolutions. All comparisons of cost and weight should, of course, be made at the same revolutions per minute.

If an actual comparison of ships is made and the operating expenses and profits calculated, the advantages of the motorship quickly offset the small disadvantages of higher first cost and greater weight per horsepower.

Why, then, is the Diesel engine not more widely adopted? The objections raised by vessel owners appear to be mostly imaginary—it is a new type of machinery still in a state of development and subject to breakdowns; repairs may be difficult to obtain for this new type of machinery, causing interrupted service and long delays in port with consequent loss in profits; Diesel machinery is easily mishandled in the hands of an inexperienced crew; there is a scarcity of operating engineers and, if the Diesel engine is widely adopted, ships may be held up for lack of a trained engine room force; breakdowns and various troubles are frequently reported, and oil cannot be secured in all ports.

Along with these objections we must bear in mind that men trained in steam engineering hesitate to give up a well known and reliable type of machinery for a new and (to them) precarious type; and that new types of machinery have always been slowly adopted on shipboard as the operating engineer must be his own repair man and the engineer cannot call on the manufacturer for advice and assistance as could be done at a power plant on shore. This last is a strong argument against the rapid adoption of the Diesel engine for ship propulsion and can only be overcome by providing well trained and competent operating engineers. Careful attention on the part of the engine builders to see that the crew is properly instructed regarding the operation of their engine, and informed of all troubles likely to occur, will go a long way to solving this problem.

The other objections can be thrown aside because the successful motorship is a demonstrated fact. Those who are competent to answer assure us that well trained Diesel engineers are available at all times.

The first large motorship appeared in 1912. Today, to give two illustrations, the East Asiatic Company has 15 motorships aggregating 150,000 tons deadweight in operation and 16 more under construction and the Glen Line has 10 motorships aggregating 110,000 tons deadweight in operation and eight more under construction. The latest addition to the Glen Line fleet, the *Glenogle*, has a length of 502 feet, a deadweight capacity of 14,000 tons and a gross tonnage of 9,150. The ship is fitted with twin screws and has a total horsepower of 6,400. This line has a number of ships similar to this under construction. One motorship of the Glen Line has already covered 170,000 miles without an involuntary stop. Many firms in Great Britain and on the continent are building up large fleets of motorships while practically none is being added to the American merchant marine.

THE FIELD FOR THE MOTORSHIP

The Diesel engine, on account of its small power and large weight per horsepower, cannot be adopted at present for high powered ships or fast passenger vessels. For the same reason it is also not suitable for naval vessels. For the cargo ship

and small passenger liners the Diesel engine is the ideal installation. Its adoption will reduce the operating expenses on account of the reduced fuel costs and greatly increase the annual profits because of the greater carrying capacity brought about by the large reduction in fuel weight and space required for fuel bunkers. As pointed out in an earlier article the weight and space occupied by fuel is about 25 percent of that required for a coal burning and 40 percent of that for an oil burning steamship.

With a short voyage, long port detention or slow speed, the gain of the motorship over the steamship is not so pronounced on account of the small percentage that the fuel costs bear to the total operating expenses. The longer the voyage, the quicker the turn around, and the higher the speed, the more pronounced is the economy of the motorship over the steamship. It is the combination of reduced fuel costs, increased deadweight and reduced crew, coupled with quick turn arounds and large number of trips per year, that produces the large gain in profits.

When a Diesel engined ship runs into bad weather there is a falling off in speed and consequently a reduction in the revolutions per minute. This reduction in the revolutions of the engine produces a reduction in power. In a steamship a falling off in the revolutions per minute does not necessarily cause a reduction in power, consequently a motorship should be provided with a somewhat larger shaft horsepower than the steamship or provided with enough overload capacity at reduced revolutions to maintain the same shaft horsepower in bad weather.

FOUR VS. TWO CYCLE DIESEL ENGINES

After the Diesel type of machinery has been decided upon the question remains whether to select a four cycle or two cycle type. The relative superiority of these two types is a much debated question today among Diesel engineers.

The two cycle engine is a far more attractive proposition on paper than the four cycle but on the other hand is not so well known nor so universally used as the four cycle. It appears that the real question is not so much a comparison or selection of cycle as of make of engine. The two cycle engine is more difficult to design and is not so well understood and there have been more frequent breakdowns and troubles with this engine than with the four cycle. Hence those arguing for the four cycle engine have laid all these misfortunes at the door of the two cycle in general instead of the manufacturer in particular. There are some builders of two cycle engines who have had very good success with two cycle engines and apparently made good most of the claims put forward for this type.

Most of the attractions of the two cycle engine are not important enough to warrant the installation of this type in a cargo ship if there is more probability of trouble than with a four cycle engine. The loss of one trip per year or increased port detention due to frequent repairs will quickly offset all the small gains brought about by more economical machinery.

Many of the features of the two cycle engine are advantageous for passenger ships and ships where weight of machinery is an important item. No doubt the two cycle engine of the port scavenging type is destined to have a large field in the future, especially after further development and experience.

The advantages claimed for the two cycle engine are:

1. Weight 60-65 percent of four cycle at same revolutions per minute (hence reduced cost).
2. Space 55-80 percent of four cycle.
3. With port scavenging, less complicated head casting; and simpler valve gear.
4. More uniform turning moment; reduced vibrations.

The disadvantages are:

1. Higher fuel consumption (5-10 percent).
2. Higher lubricating oil consumption.

3. Lower mean effective pressure.
4. Special means of cooling required on account of great heat effects.
5. On account of heat, at high speeds, piston cooling must be adopted.

DIESEL-ELECTRIC DRIVE

The Diesel-electric drive has been frequently proposed and to some extent actually fitted. The merits of this type of machinery are that one or more high speed Diesel engines, driving electric generators, can be installed and the ship propelled by an electric motor of low revolutions per minute and hence high propeller efficiency obtained without reducing the engine revolutions.

Most of the claims brought forward for the electric drive with steam machinery apply equally well to this type of installation and as already pointed out offer no particular attractions for cargo ships.

For the electric drive the first cost will be higher than for direct Diesel drive; the saving in weight will be small; and the installation will be much more complicated. Certainly little gain in economy or propeller efficiency can be claimed; and the direct connected Diesels of low revolutions per minute will be more reliable in service than the high speed generating sets.

The Diesel electric drive, however, does offer many ad-

vantages for naval vessels, yachts and fishing vessels where easy control and high economy at reduced speed are important factors.

THE STILL ENGINE

The Still engine is fitted with a double acting cylinder with the Diesel cycle on one side of the piston and the steam cycle on the other. The object of this combined steam and Diesel engine is to use the heat of the exhaust and cooling water in producing steam and thus increase the efficiency.

An efficiency 20 percent better than that of the Diesel engine is claimed for this prime mover. The engine has many interesting and valuable features. Theoretically it is an ideal and most efficient prime mover. Whether the complications of fitting a steam boiler and piping in combination with a Diesel engine will be feasible in practice remains to be seen. As an offset to the complications of the steam equipment the engine requires no circulating, air starting, or piston cooling system.

Comparative trials with a Still engine and a Diesel engine of 200 horsepower have recently been reported (Institution of Naval Architects, 1920) showing a reduction in fuel consumption of only 5 percent. This is rather disappointing, but future trials and experience with the Still engine may show much better results.

New Molding Material Eliminates Blow Holes in Thermit Welding

A NEW grade of molding material for Thermit welding, designed as "Thermit Molding Material," has recently been developed by the Metal & Thermit Corporation, New York, which, as proved by extensive researches and practical experiments, when used in accordance with the regular Thermit practice, will definitely prevent blow holes and assure sound welds.

The design of the new molding material is based on the theory that good silica sand will stand the heat of the Thermit reaction very well and that the weakness in all molding material is the clay binder. Therefore there should be as little clay as possible in the mixture, in order to make the mold more refractory and to increase its porosity. It is logical, therefore, that the use of a plastic clay has been selected instead of a fire clay, as formerly. The sand and plastic clay are ground together in a foundry pan or Moller, with the intention of coating each grain of sand with a minimum thickness of clay. This has resulted in a clean molding material, which should be rammed hard in the mold, which will stand up well under the preheating flame and which is extremely porous to the gases generated in the mold, resulting in a sound weld with a very clean exterior. Although suitable molding material can be made by increasing the clay content slightly and mixing the clay and sand thoroughly by hand, it is not so good as that made with a smaller clay content in the foundry pan or Moller.

The mixture now being used is composed of the following: 3 parts clean, sharp silica sand (100 percent of which should pass through a screen having a .03 inch square opening, and 40 percent of which should be retained on a screen having a .012 inch square opening) mixed with 1 part Welsh Mountain plastic clay. These parts are first thoroughly mixed in the Moller together with one-fortieth part glutrin by volume and sufficient water (one-twelfth part) to bring to the proper consistency. If mixed by hand, the sand and clay must be dried before mixing (being careful not to subject the clay to a temperature higher than 400 degrees Fahrenheit) and thoroughly mixed before adding the glutrin and water. The glutrin should be mixed with the water before adding to the sand and clay.

In the production of sound welds it is absolutely essential

to be sure that no loose sand exists in the mold when the Thermit steel is poured. This is why very hard ramming is advocated, also why it is most important to blow out loose material from the interior of the mold by putting the preheating burner in the riser before the heating gate is plugged and being sure that no sand is detached by the operation of inserting this heating gate. The burner should be removed from the riser before plugging the heating gate, because otherwise it may detach some sand, which could not be blown out after the plug is in place. The heating gate plug should be thoroughly dry; and, if it has been carried in stock for some time, it should be warmed before using.

By perforating the sides and bottom of the mold box, the escape of the gases which pass through the molding material is greatly facilitated. Three-eighths inch diameter holes, spaced 3 or 4 inches apart, are sufficient. To facilitate the escape of gas from the bottom of the mold box, the mold should rest on blocks, not directly upon the foundry floor. As unnecessary molding material simply increases the resistance to the passage of gas, the mold box should be made as small as possible commensurate with safety. For example, in welding a 4-inch by 4-inch section, only about 4 inches of sand is necessary at all points, except, perhaps, on the pouring gate side. It is most important thoroughly to vent the mold box by forcing a rod or wire down at a number of points to within $\frac{1}{2}$ inch or so of the collar. Care should be taken that these do not touch the collar because such vent holes will fill with steel and will therefore not facilitate the escape of gas.

LAUNCH OF S. S. YSSELDYK.—The steel cargo steamer *Ysseldyk* was recently launched at the Werf Gusto, Firma A. F. Smulders, Schiedam, Holland, for Messrs. Solleveld, van der Heer & T. H. van Hattum's Steamship Company, Rotterdam. The vessel is of the shelter deck type with a cargo carrying capacity of about 6,500 tons deadweight. The length between perpendiculars is 359 feet 3 inches, the breadth 50 feet and the molded depth 24 feet 6 inches. Propulsion is by a triple expansion condensing engine of about 1,800 indicated horsepower, supplied with steam by three single ended Scotch boilers of about 5,450 square feet heating surface working at a pressure of 180 pounds per square inch. The designed speed is 10 knots. The vessel is supplied with the necessary steam auxiliaries and is lighted throughout with electricity.

Modern Methods of Casting Propellers*

**Molding Process Developed by George H. Thacher & Company
Produces Propellers in as Many Hours as Old Method Took Days**

THOSE acquainted with the marine field are aware of the remarkable developments of late years in the scientific study of the screw propeller, which enable the engineer of the present day to design a propeller wheel that will satisfactorily meet all specification requirements provided the finished wheel complies in all details with the design laid down. The propeller troubles of today, therefore, are chiefly of a practical nature in producing a perfect casting and many failures may be attributed to this cause.

GENERAL METHODS OF PROPELLER MANUFACTURE

There are two general methods of manufacturing propeller wheels which are known as the sweep method and the pattern method.

In the sweep method the bottom half mold or nowel for each blade is swept up by a spindle, beam and pitch race and the cope or top half mold for each blade is built up individually on the nowel.

The pattern method is similar except that in place of the pitch race and sweep a blade pattern with the hub or a portion of the hub is mounted on a spindle and the blade molded, after which the pattern is rotated on the spindle to the proper position for the next blade. A solid pattern is sometimes used with this method instead of a single blade and spindle.

Both green sand and loam molding have been practiced with the above methods and the castings produced by each have been considered rough castings from which the finished product is produced by machining the driving face of the blades, boring, facing and keyseating the hub and by chipping the back of each blade to suit the template and provide for static balance.

Aside from the fact that the above methods are not conducive to either perfection or economy it is known that corrosion will be greater because of the removal of the dense skin of the casting and the local strains set up by the pneumatic tool in chipping.

THACHER PROCESS

The Thacher Propeller and Foundry Corporation of Albany, N. Y., has been engaged in the manufacture of marine castings for a number of years but it was not until the outbreak of the world war that it decided to specialize in the manufacture of propeller wheels. Since then it has developed what is known as the Thacher molding process for propeller wheels and blades, which represents a marked advance over previous practice for work of this kind.

By this method it is possible to cast propellers that will be accurate as to diameter, pitch, blade area and thickness and in perfect balance when taken from the mold, no machining of the blades being necessary other than polishing or buffing to remove roughness along the edges.

The new process lends itself to speed in production as well as economy and a solid propeller, that would require six weeks to produce by the old process, can be molded, poured and shipped in one week.

Such a marked saving in time, of course, will be invaluable when measured in terms of detention of a vessel in port for repairs, to say nothing of the less cost of a new propeller.

*From information furnished by the Thacher Propeller and Foundry Corporation and a paper to be presented at the fall meeting of the American Institute of Mining and Metallurgical Engineers, at Wilkes Barre, Pa., by Dr. Enrique Touceda.

EQUIPMENT FOR MOLDING PROPELLERS

There are 13 pieces of equipment necessary for the molding of a propeller by this process which are as follows:

1. Base or assembly plate
2. Template or jig
3. Nowel pattern plate
4. Nowel pattern block
5. Nowel
6. Cope pattern block
7. Blade pattern
8. Cope container
9. Cope
10. Center plate
11. Center arbor
12. Arbor cap.
13. Pouring ring or basin

BASE OR ASSEMBLY PLATE

The base plate is an iron casting permanently located on the foundry pouring floor, the top surface of which is machined to a true plane.

For small wheels the base plate is a single casting but for the larger sizes it is made in two or three parts.

A hole is drilled in the center of the plate by means of which the jig is located when drilling the holes for the flask assembly.

TEMPLATE OR JIG

The template, which is used for locating the assembly holes in the base plate, nowel pattern plate, cope container, nowels and copes, is made of cast iron, machine finished to a true surface and drilled with the greatest precision.

NOWEL PATTERN PLATE

A heavy, machine finished plate, of similar form to the top of the nowel and with corresponding holes, is used as a base upon which the nowel pattern block is mounted. The chief function of the plate is to definitely locate the driving face of any blade, molded from the same pattern, relative to the plane of the top of the nowel.

NOWEL PATTERN BLOCK

The nowel pattern block is mounted upon the nowel pattern plate. At the base the block corresponds in shape with the top of the nowel but a taper of about one inch per foot is given the sides and tip end to facilitate drawing. The hub end is set at an angle of 90 degrees or 120 degrees depending on whether the wheel is four bladed or three bladed. The block is built of ordinary pattern wood to approximately the required height and then the top surface is faced with mahogany or cherry and swept down by means of a spindle, beam and race to the true designed pitch.

COPE PATTERN BLOCK

The cope pattern block is erected upon the nowel pattern block to insure that the bottom face exactly matches the top face of the nowel block pattern. The hub end of the cope pattern block is also built to correspond with the hub end on the nowel pattern block.

The form of the blade and thickness is provided for by next fitting a complete blade pattern to the face of the cope block.

NOWEL

The nowel or bottom half of each flask is rectangular in form except at the end near the hub which forms an angle of

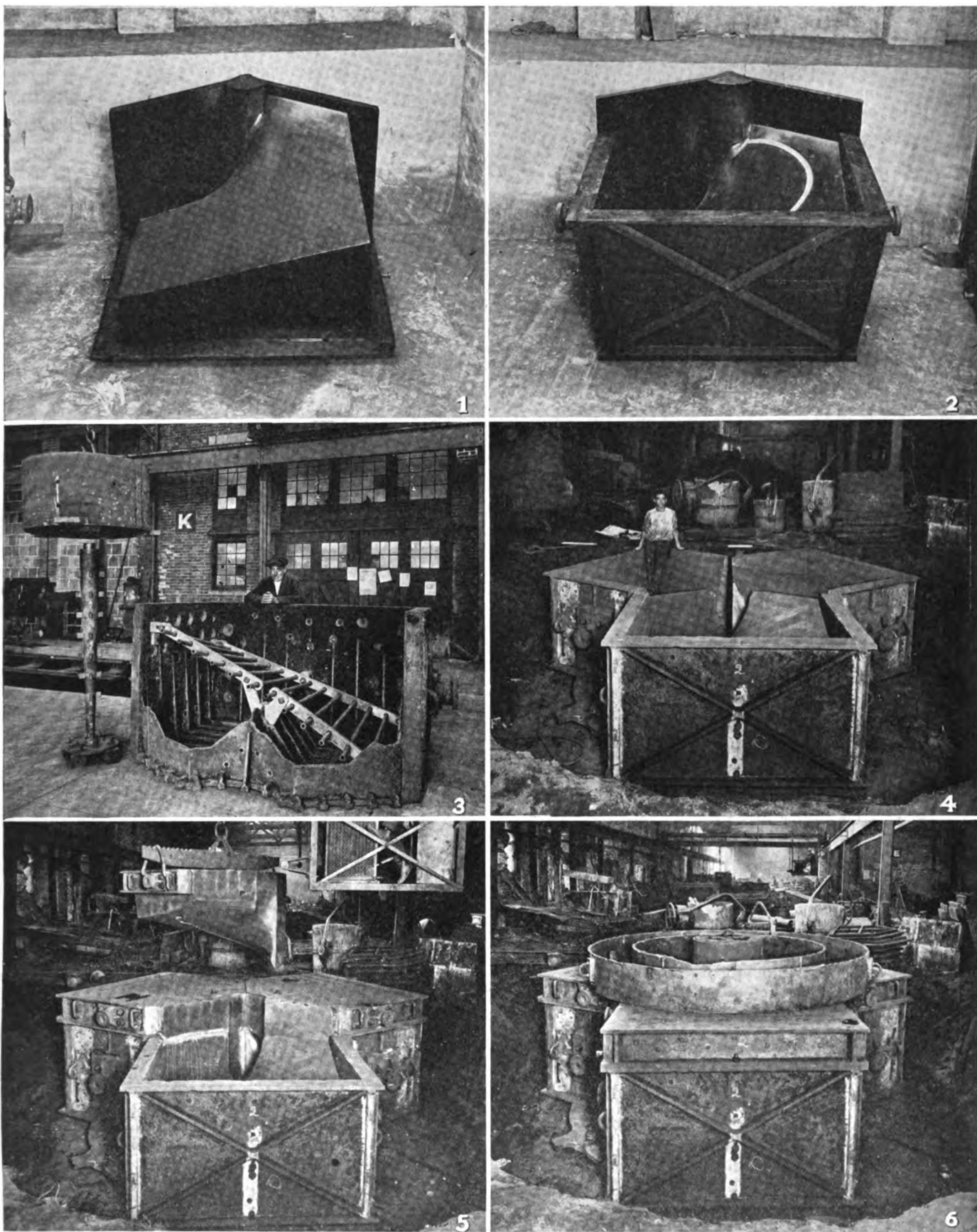


Fig. 1.—Standard Nowel Pattern Mounted on Nowel Plate. Fig. 2.—Standard Cope Pattern, with Blade Pattern in Place Mounted in Cope Container Ready for Molding. Fig. 3.—Nowel Flask Containing Adjustable Sand Reinforcing and Center Core Equipment. Fig. 4.—Three Nowels Assembled on Assembling Plate After Baking. Walking in the Mold Does Not Injure or Deface It. Fig. 5.—Placing the Copes in Position, the Blade Form, Pouring Gates and Dowels for Positioning the Arbor Cap Being Clearly Shown. Fig. 6.—Completely Assembled Flask Ready for Pouring

90 degrees or 120 degrees depending upon whether for a wheel of four or three blades. It is made of cast iron and the top end is open to permit fitting the pattern, the bottom having crossbars for strength and sand carrying. There are heavy flanges at the top and bottom which are machined in parallel planes and in which holes matching those in the cope and assembly plate have been drilled.

Sand carrying bars for stiffening the mold are fitted to both the nowel and the cope and these are adjustable to provide for variations in pitch and also for either right or left hand wheels.

COPE CONTAINER

The cope container is a receptacle used principally for ramming up the cope. It is made of cast iron with the sides and tip end tapered to suit the draft angle and the hub end angular similar to the nowel. Flanges at the top and bottom are machined in parallel planes and drilled to take a cast iron plate at the bottom, which supports and holds the pattern during ramming, and the cope at the top.

Inasmuch as the cope container is used for molding the cope, both the nowel and cope pattern blocks should be carefully made to fit it in regards to area, shape, etc.

COPE

The copes are shallower castings of similar general construction to the nowels. Heavy ribs are spaced at intervals and the top and bottom flanges are machined in parallel planes and drilled from the jig to match the nowel.

CENTER CORE

A center arbor of hollow cast iron with turned ends carries the center core. It is held in position at the base by a

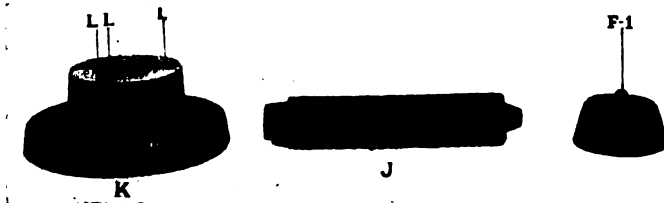


Fig. 7.—Center Core Made Up with Sand: F-1 Is the Center Plate, J the Center Arbor and K the Arbor Cap, with Holes L Used as Risers

cast iron center plate and at the top by an arbor cap or cast iron ring with a center held in position by brackets at the top. The cap is supported by lugs cast to the bottom of the ring which rest on the copes. Holes in the lugs fit over dowels in the copes and in this manner the cap is held in position. It is made up with sand, several holes through which provide for the risers.

POURING RING OR BASIN

The pouring ring is in the form of a circular cast iron trough with gates to each blade. The metal flows through each blade to the hub and rises through the hub riser until sufficient head is established to provide solidity.

DESCRIPTION OF MOLDING OPERATIONS

The nowel pattern plate with the pattern block is set on a substantial floor and the nowel is placed over the pattern on the plate and bolted to the plate through the template holes in both. It should be remembered that the face of the pattern plate and both top and bottom flanges of the nowel are accurately machine finished in parallel planes, so that with the nowel in position and bolted to the pattern plate the bearing flange face of the nowel is in perfect contact with the pattern plate. The pitch plane on the pattern is therefore definitely positioned inside of the nowel with relation to the plane of the contacting surfaces and the drilling therein.

A suitable, strong, dry sand facing is riddled on to cover the pattern block. A weaker dry sand mixture is then evenly rammed or tamped, as the sand is dropped in, until the nowel is full and butted off even with the cross ribs and flanges. For large wheels the mold is made of a combination of Milville gravel and sharp Albany sand and for the small ones a combination of fine sand and linseed oil at 20 to 1 is used. A machine finished dry plate is next bolted to the nowel bottom and the nowel and nowel plate rolled over and deposited on a core oven truck after which the nowel pattern plate is unbolted and drawn off, using guide pins. The nowel is then ready for baking.

The nowel pattern is replaced on the floor and the second nowel placed in position and bolted thereon.

The same operation is conducted in the molding of the copes. While the description indicates that the copes are molded after the nowels, the two operations would naturally proceed at the same time. In the case of a 9-foot, three blade, destroyer wheel, or similar wheels up to 12 feet in diameter, with both cope and nowel production as described, the average molding time would not exceed 5 to 6 hours.

The mold is baked from 16 to 18 hours in an ordinary core oven at temperatures from 360 degrees to 420 degrees Fahrenheit (182 degrees to 216 degrees Centigrade) after which it is given an ordinary coat of plumbago wash and is ready for assembling.

The process is also adaptable for molding machine use which further lessens production costs. Wheels having blades of substantial size have been completely molded on a combination jolt and roll over machine. While to date a roll over device large enough to handle a 20 foot wheel has not been made, the construction of such a machine is in contemplation.

For individual blades the same practice applies, with equal economy in time, material and accuracy of production.

ASSEMBLING

The assembly plate is thoroughly cleaned and each successive baked nowel is placed and bolted in position, as fixed by the jig. The baked copes are successively placed on the nowels and similarly bolted; the center plate being lowered in place in the center hole of the assembly plate and the joints between the copes and the nowels closed through the top opening by the use of slurry or lead paste. The center arbor is entered into the center plate, the arbor cap set over the center arbor and the pouring ring set on the copes and made up. The mold is then ready to pour. The operation of assembling the mold requires about 3 hours.

POURING

The mold is poured through gates near the tips of each blade, insuring uniformity of flow and metal distribution as well as casting solidity and clean metal. Pouring near the tips of the blades washes out any grit or dust which might be left in the mold and which rises through the hub, no other risers being provided. The casting is left in the mold about 24 hours to avoid any danger of internal strains. The equipment is ready for the production of the next wheel as soon as the sand is shaken out of the cope and nowel. This sand, when cooled and wet down, can be used again on top of a new facing of sufficient depth to cover properly the pattern blocks.

STANDARDIZATION OF EQUIPMENT

For wheels built integral and for commercial use, the equipment is built in three standard sizes, 12 feet, 16 feet and 20 feet in diameter. Each unit is designed for either three- or four-blade wheels. For built up wheels the same standards are maintained.

PATTERN-BLOCK STANDARDIZATION

The patterns are standardized in diameter to suit the equipment diameter capacity, and in pitch to standard prac-



Fig. 8.—Testing for Patch

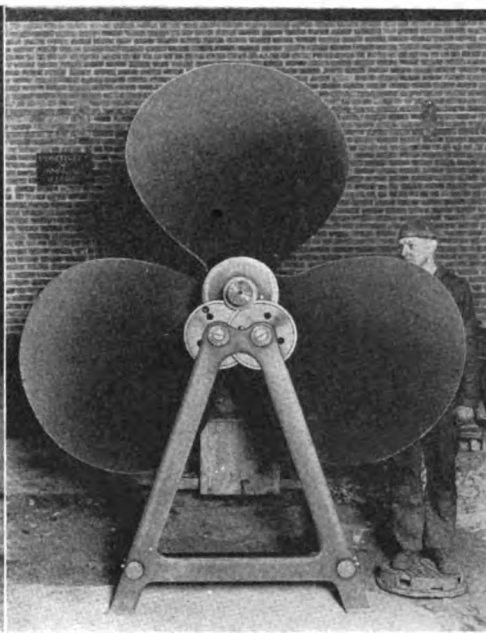


Fig. 9.—Testing for Balance

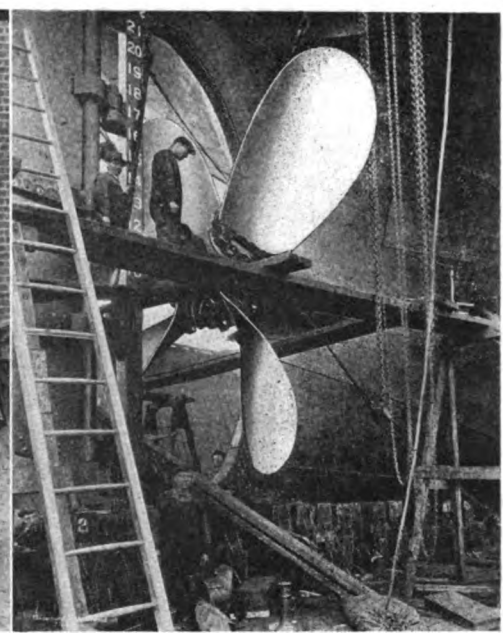


Fig. 10.—Installation of Finished Propeller

tice. For example, the patterns for the 16-foot equipment would be of sufficient length to fit the container of diameter capacity from 12 to 16 feet. The pitches on the pattern blocks are standardized for, say, 6-inch pitch variation and the required pattern blocks for the 16-foot equipment would be 14 feet 0 inches, 14 feet 6 inches, 15 feet 0 inches, 15 feet 6 inches, 16 feet 0 inches, 16 feet 6 inches, 17 feet 0 inches, 17 feet 6 inches and 18 feet pitch; or nine pitch blocks only are required to manufacture wheels of any diameter from 12 to 16 feet and with any combination of standardized pitch.

Assuming that wheel diameters increase by 3-inch variations, 108 combinations of wheel diameter and pitch may be made from nine standard pitch blocks by simply changing the blade form and area on the pitch block. Thus, while the initial cost of one pattern block, including blade form, may exceed the cost of the ordinary blade and hub portion, the total pattern cost, by the use of this process, is ultimately greatly reduced.

TESTS

Tests are conducted by mounting the wheel, by means of a balanced turned arbor in which are keyways, on a balancing stand. Keys are inserted on each side of the hub.

Through such tests the static balance of the wheel can be determined and by bringing a template into contact with similar sections of each blade the wheel can be tested for correctness in diameter, pitch, blade thickness and balance from an established center which, through this procedure, is accurately located for the subsequent boring to fit the propeller shaft.

By the Thatcher process a perfect propeller wheel should result because the base plate is correctly machined, the positioning holes are located by template from the center and at the correct angle, and because the pitch plane in both nowel and cope patterns is transferred from the machine finished surfaces of the nowel pattern plate and cope container to a fixed position relative to the planes of the machine finished surfaces of each cope and nowel. When the machine finished surfaces of the cope and nowels are bolted together, the two pitch planes are in contact leaving an exact blade thickness or pattern reproduction in each blade mold. As the top flange in the nowel is machined parallel to the bottom flange of the nowel and the nowels are all of even height, it follows that when the nowels are bolted to the machine

finished assembly plate the pitch planes are parallel with regard to the assembly plate and therefore in relation to each other.

Propellers cast by this process are bound to be exact duplicates in diameter, form and distribution of metal.

The above being true, the weights of similar wheels, when tested for balance and machined exactly alike at the hub, should also check closely. Tests have shown this to be the case and for large wheels—wheels of about 14 feet diameter weighing 11,600 pounds—the variation in weight has not been in excess of 10 or 15 pounds, while for small wheels of about 2 feet diameter and 90 pounds weight the variation doesn't exceed a few ounces.

The process further lends itself to economy in operation by virtue of the fact that the slip is reduced due to the accuracy of the casting and repairs and danger of breakdown reduced on account of the perfect balance.



Launching of the Peninsula State

The S. S. Peninsula State was launched from the North Yard of the New York Shipbuilding Corporation, Camden, N. J., Wednesday afternoon, July 6, 1921. It was the last to be launched of a group of nine similarly designed 21,200-ton passenger liners under construction for the United States Shipping Board.

Innovations in Diesel Engine Construction

German Builders Introducing Novelties in Burmeister and Wain Design—Blohm and Voss Building New Double Acting Engine

By Our Special London Correspondent

THE fact that there are now just over 200 large motorships under construction in various yards in Europe, totaling more than 600,000 tons gross, is good evidence of the progress now being made with oil engine propulsion. Before the war, the total tonnage of such vessels afloat was 234,000, a figure which has now increased to over 1,250,000. The slump in shipping has naturally put an end to orders for new tonnage, although this does not apply to Germany, where the greatest activity is being shown. British shipbuilders are somewhat perturbed at what is taking place in Germany for they see that, as a consequence of the majority of the German steamers being handed over to the Allies under the terms of peace, German shipowners are taking the opportunity to build up a new fleet of motorships, against which the old steamers purchased by various Allied shipowners will, in the future, have little chance to compete.

Among the orders recently placed in Germany are those for ten ships varying from 5,500 tons to 8,000 tons, all of which are being built at the new Deutsche Werft of Hamburg, many of them for the Hamburg-American Line, which has also placed orders with Blohm and Voss for some double acting engines. The Deutsche Werft is virtually part of a huge combination which includes the Gutehoffnungshutte and the A. E. G. of Berlin, the former works supplying most of the raw materials for the hulls, while the latter concern provides all the Diesel machinery.

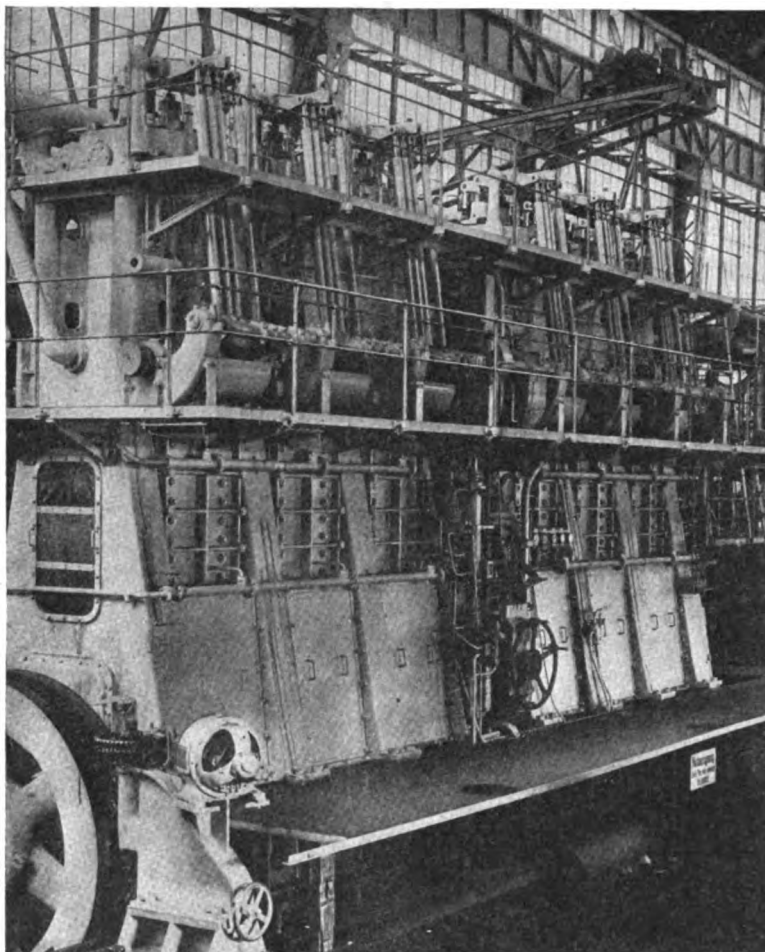
BURMEISTER AND WAIN ENGINES ADOPTED IN GERMANY

The engines, of which 20 are now being built for installation in the ten vessels, are of one standardized type, and are being manufactured under license from Burmeister and Wain. In order that production might be hastened, the drawings of Burmeister and Wain have been copied in practically every particular and those who are familiar with Burmeister and Wain machinery will at once see from the illustration that the A. E. G. engine is the same as the B. and W. type built in Denmark, Sweden, Norway, Great Britain

and America. It is indeed a remarkable achievement for a Danish firm to have its design thus taken up in all the leading shipbuilding countries of the world.

The A. E. G. engine develops 1,550 indicated horsepower (one of the most popular of the Burmeister and Wain standards) and has the usual six cylinders 630 millimeters diam-

eter and 960 millimeters stroke, the speed of revolution being 125 per minute. A novelty has been introduced by the A. E. G. designers which is worth noting and which appears to have some advantages. This concerns the method of reversing. On the left of the large handwheel seen in the illustration is a small hand lever which, when moved to the right or left (according to the direction of rotation required), operates a servo motor; this first lifts the push rods off the cams on the camshaft, then moves the camshaft until the push rods are above the astern cams and finally drops the push rods down on to the cams, thus setting the valve gear for astern rotation. The large handwheel is next given a partial rotation, admitting compressed air to the cylinders and allowing the engine to start. A further movement of the handwheel cuts air off three cylinders and brings them on to fuel, while a final rotation causes the remaining



A 1,550 Indicated Horsepower A. E. G. Engine Built in Berlin to Burmeister & Wain's Designs

three cylinders to operate on oil. In the ordinary Burmeister and Wain engines this handwheel is not used, but in its place are two handlevers, one controlling each group of three cylinders. The latter arrangement gives a more independent control, but on the other hand the wheel is simpler to manipulate, and consequently would be likely to appeal strongly to a certain class of marine engineers who dislike complications.

DOUBLE ACTING ENGINES

With regard to the other German motorships being built, these are to be fitted with Sulzer, Krupps and M. A. M. engines, in addition to a number of vessels in which Blohm and Voss will install their double acting motors. The very greatest secrecy prevails in connection with these sets, and it appears perfectly impossible to obtain any information concerning them. It is believed, however, that some double act-

ing engines are now in course of manufacture, larger than any internal combustion motors yet produced.

Blohm and Voss have brought out a new design, based on the experience gained with their first double acting engines, and it is not unlikely that some of the departures made will be quite revolutionary. It is well known that in a double acting engine one of the difficulties which the designer encounters is to obtain reasonable power at the bottom side of the piston, partly owing to the presence of the piston rod in the combustion space and partly owing to the difficulty of obtaining efficient combustion, since the piston rod is placed centrally. This has been overcome to a certain extent in the new Blohm and Voss engines by the adoption of double piston rods, with the fuel valve between them, while another innovation will probably be the employment of scavenging ports instead of valves, thus simplifying the design to a marked extent. In the existing double acting engine two scavenging valves, top and bottom, have been utilized on each cylinder so that there are more valves required than in a four cycle motor. Other improvements include a better lubricating oil system and a modified cylinder construction, but it is doubtful whether much more will be learned of these new engines until the first sets are put into operation.

UTILIZING OIL ENGINE EXHAUST GASES

One of the features of the latest Vickers engined motorships, the *Scottish Maiden*, which has just been launched and which is the fourth built during the past eighteen months, is that an attempt is made to recover some of the heat in the exhaust gases, the waste of which has always been a reproach to the internal combustion engineers. Many years ago the Werks-poor Company passed the exhaust gases around a boiler and raised steam for auxiliary purposes but, for some reason, the results were not as satisfactory as had been hoped. Vickers have now adopted a somewhat similar plan, and on the *Scottish Maiden* the exhaust from the two main engines is used to raise steam in a Bonecourt boiler, this steam being sufficient, it is thought, to run all the steam driven auxiliaries required when the vessel is at sea. This arrangement would not be applicable to most motorships where an electrical plant is utilized almost exclusively but on the Vickers vessels, which are tankers, steam auxiliaries are adopted. The experiment will be watched with some interest as shipowners are now anxious to economize in fuel to the last pound and, if a saving of only 5 percent can be obtained, the system is distinctly advantageous. Experiences alone will tell what practical difficulties, if any, may be encountered with this system.

13,500 Deadweight Ton Motorship Malaya

Twin Screw Vessel Equipped with Direct Reversible, Crosshead Type Diesel Engines Developing 4,500 Indicated Horsepower

ANOTHER example of the growing tendency to equip the largest freighters with Diesel motor propelling units is the motorship *Malaya*, the trials of which were conducted by the builders, Burmeister & Wain, Ltd., Copenhagen, on July 9 of this year.

The *Malaya* and a sister ship, the *Afrika*, were built for the East Asiatic Company, Ltd., Copenhagen, to engage in trade in the Far East.

CHARACTERISTICS

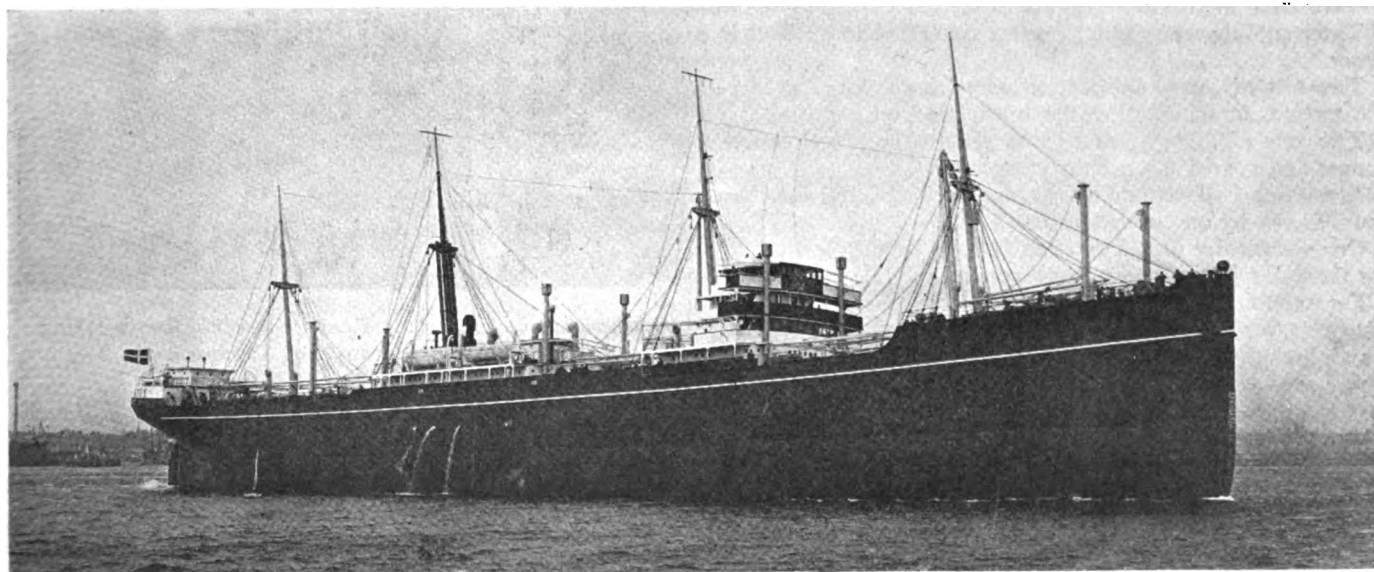
The *Malaya* was built to Lloyd's rules, class 100 A 1-awning deck with freeboard, and has the following characteristics.

Length overall 464 feet 6 inches
Length between perpendiculars 445 feet 0 inches

Breadth, molded 60 feet 0 inches
Depth, to awning deck 42 feet 0 inches
Depth to upper deck 33 feet 3 inches
Depth to lower deck 23 feet 3 inches
Draft, loaded 32 feet 0 inches
Displacement 19,000 tons
Deadweight capacity 13,500 tons
Gross tonnage 9,050 register tons
Loading capacity, grain 700,000 cubic feet
Loading capacity, bales 640,000 cubic feet
Water ballast 1,664 tons
Bunker capacity 1,472 tons
Cruising radius about 30,000 miles

PROPELLING MACHINERY

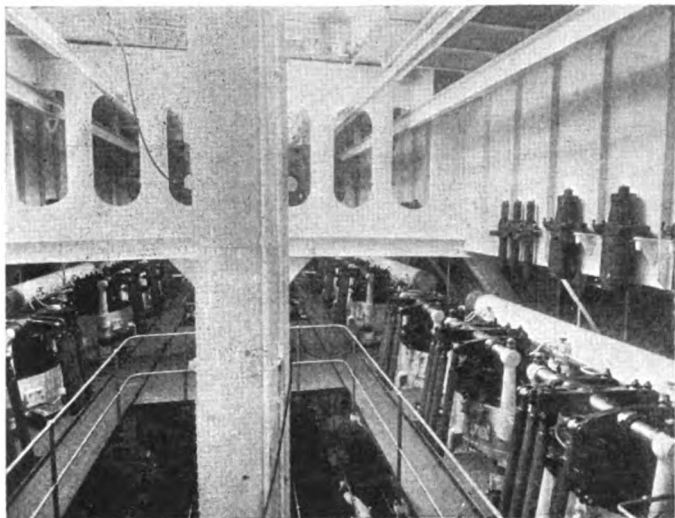
The propelling machinery consists of two six cylinder main motors of Burmeister and Wain's standard direct reversible, forced lubricated crosshead type. They have cyl-



Motorship Malaya on Trial Trip

inders 740 millimeters in diameter and 1,150 millimeters stroke. Each engine develops 2,250 indicated horsepower or about 1,750 brake horsepower and together will give the ship a speed of 12 knots when fully loaded.

The fuel consumption of the *Malaya* is estimated at 14 tons per 24 hours based on data recorded during the maiden voyage of its sister ship *Afrika*. On the trial trip the consumption was measured for a period of 4 hours, during which the engines developed an average of 4,585 indicated horsepower at a consumption of 135.3 grammes per indicated horsepower with common crude oil. This corresponds to



View of Engine Room from Upper Grating

a consumption of 14.8 tons per 24 hours. The fuel consumption in motorships, however, is always greater on trial trips than on the following voyages due to the fact that the machinery on a short trial does not become fully heated and therefore the economy will not be as great as during normal work at sea.

The main engines are cooled with fresh circulating water and a fresh water cooler. This arrangement eliminates the drawing of mud into the cooling system which often happens when deep draft motorships are navigating the shallow waters usually found in harbors and rivers.

AUXILIARY MACHINERY

Electric auxiliary machinery is used throughout the vessel consisting of the following:

Three cooling water pumps direct connected to an electric motor.

Two sets of forced lubricating oil pumps, geared to electric motors, for circulating the lubricating oil.

Two sets of bilge, sanitary, fire pumps, built as plunger pumps and geared to an electric motor.

A rotating ballast pump, with a capacity of 150 tons per hour, driven by an electric motor.

One electrically driven rotating fuel oil pump for supplying the daily service tanks and trimming the oil.

For pumping up the maneuvering compressor with maneuvering air of 25 atmospheres pressure and as spare for the air pump for the main motors according to Lloyd's rules there is an electrically driven two-stage auxiliary compressor.

ELECTRIC PLANT

The electric plant consists of three 66 kilowatt, 220 volt generators driven by auxiliary Diesel engines of 100 horsepower each. These supply the necessary current for operating the engine auxiliaries and deck machinery as well as lighting the ship. For the lighting system the current is

transformed to 110 volts by means of a rotating transformer.

The refrigerating machinery for ship's use aboard the *Malaya* was furnished by A. S. Thomas Ths. Sabroe & Company, Aarhus.

An electric windlass was furnished by Clarke, Chapman & Company, and the electro hydraulic steering gear by John Hastie & Company.

The vessel is rigged with 4 masts and amply supplied with derricks for handling cargo, there being one derrick of 30 tons, one of 15 tons, twelve of 5 tons and eight of 2 tons capacity operated by 20 electric winches supplied by Almann Svenska Elektriska Aktiebolaget, Vesteras.

ACCOMMODATIONS

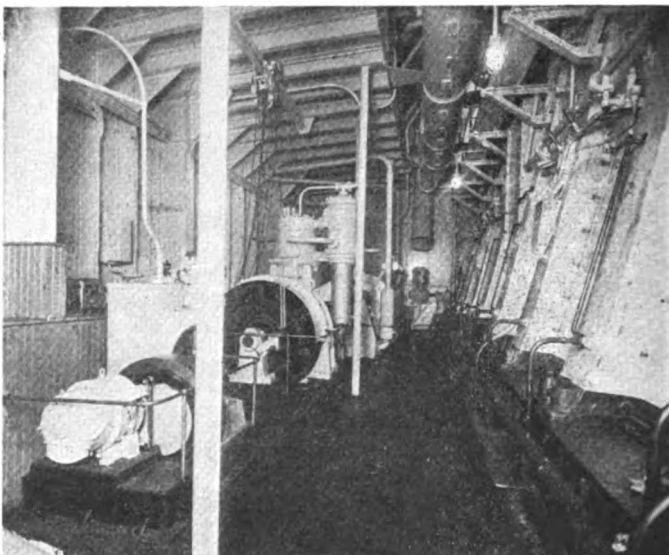
Besides the accommodations for the crew, there are rooms for 12 passengers in the deckhouse below the bridge.

The crew is accommodated in rooms aft arranged for 2 men each.

Both passenger and crew's quarters are heated by steam generated in a small boiler with a heating surface of 100 square feet. This boiler also drives a small compressor which may be used for pumping up the air bottles of the ship in the case of the air being blown out during a stop of long duration.

TRIALS

During the trial trip several runs were executed over the measured mile and an average speed of 13.1 knots was obtained. The ship was light. Draft forward 7 feet 5 inches, aft 15 feet 9 inches, displacement 6,180 tons. The maneuvering from full speed ahead to full speed astern was carried out to the entire satisfaction of all those present. On board were besides the representatives of the Danish Government's ship inspection, representatives of the East Asiatic Company, Lloyd's Register of Shipping, as representatives of the Ocean Steam Ship Company, Ltd., Liverpool, the Honorable Mr. Cripps, Mr. Hobhouse, Mr. Martin and Super-



Starboard Side of Engine Room, Showing Refrigerating Machine and Maneuvering Compressor

intending Engineer Mr. Freeman, and from the Rotterdamsche Lloyd, Superintending Engineer Mr. Weidenaar; as these two shipping companies have decided to add motorships fitted with Burmeister & Wain's Diesel engines to their fleet.

The *Malaya* left Copenhagen on the 16th of July for her maiden voyage to the Far East.

Timbers and Lumber for Shipbuilding Purposes

By Horace Holden Thayer*

This is the fourth of a series of articles containing information regarding shipbuilding materials and their uses that is not readily obtainable from shipbuilding handbooks and other generally available sources. The articles are not intended to be a complete exposition of the subject but will be found to contain items of value to the various classes of workers who have to deal with these materials from the materials point of view.

MANY different kinds of woods are used for shipbuilding purposes throughout the world and only such of them as are available for and used for shipbuilding in this country will be here dealt with.

An extremely valuable study of woods grown in the United States has been made by the Forest Products Laboratory of the Forest Service of the U. S. Department of Agriculture, located at Madison, Wisconsin; and many of the specifications and standards which govern the identification, marketing, use and care of these woods are based directly on their work. Their publications are available to all those interested in the subject and are as interesting as they are valuable. The Forest Products Laboratory has had in hand for about three years the preparation of a "Handbook of Technical Information on Wood for the Use of Shipbuilders" and the writer has been advised that the manuscript was recently completed but publication has been delayed because of lack of publication funds resulting from curtailment in governmental expenditures. It would seem to the writer that the curtailment might more profitably be made elsewhere, particularly when it affects work practically completed.

CLASSIFICATION SOCIETY REQUIREMENTS

Where a steel or wood vessel is classed the species and grade of all wood having any bearing on her strength or seaworthiness have to meet certain requirements of the classification society concerned, and where not classed these standards or some other good standards should be adopted. There are some woods that the classification societies will accept for the structural members of various kinds, and they have assigned to these woods of the proper grade such periods of life under the particular service, as experience has shown may be counted upon, with proper care in the construction and maintenance. Inferior woods may be accepted with a corresponding reduction in the length of the period for which the vessel is classed, but their use is poor policy and only leads to excessive expense for renewals at subsequent surveys.

The principal timber for wood hull construction on the eastern and gulf coasts is southern long leaf Yellow Pine, and on the Pacific Coast, Douglas Fir, which in the east is more often called Oregon Pine. White Oak is used in considerable quantities where available, particularly on the Great Lakes; and in the New England district use is made of the Beech, Yellow Birch, Rock Maple and Chestnut there available. Yellow Pine and Douglas Fir are classed as soft woods while the others are hardwoods.

Other woods are frequently met with in parts of the construction of wood ships and more frequently in their joinerwork, and in the joinerwork, decks and ceiling of steel ships; and some information regarding the more important of them will be given.

GRADING

Timbers and lumber are graded and classified according to rules laid down by associations whose names indicate the woods dealt with. Those of most interest to the shipbuilders are as follows:

*Member of Rossell & Thayer, naval architects and marine engineers, Philadelphia, Pa.

Southern Pine Association, with headquarters at New Orleans, La.

West Coast Lumbermen's Association, with headquarters at Seattle, Wash., and Portland, Ore.

Southern Cypress Manufacturers' Association, with headquarters at New Orleans, La.

National Hardwood Lumber Association, with headquarters at Chicago, Ill.

Yellow pine timbers and lumber for ship construction should conform to the following requirements:

- (a) All timbers and planking to be of Select Structural grade, which is sometimes called Dense Merchantable. This conforms to a density requirement and also demands at least 85 percent of heart, girth measurement, measured anywhere in the length of the piece.
- (b) All planking, calked decking and ceiling to be also specified "Square Edged," and all decking to be cut clear of the pith or center of the tree.
- (c) All outside timbers and planking from the keel to the rail, including Poop, Bridge and Forecastle sides, and from the waterways of weather decks to the centerline of the ship, including hatch coamings and any deck girders, should also be specified to have one wide face of every piece all heart, free of wane, and to show on edges adjoining the heart face 85 percent of heart for the full length of the stick. Floors and frames should be all heart where the sizes necessary will permit.
- (d) Sills, plates, studs, beams and other construction members of erections to be Select Structural.
- (e) Tongue and Groove material for erections, including canvas covered decking, should preferably be "A" grade, but grade "B" will answer for a large amount of the less particular work. It should be kiln dried.
- (f) Tongue and Groove material for hold bulkheads to be Select Structural and for bunkers to be No. 1 Common, both edge grain, kiln dried.

Douglas Fir timbers and lumber for ship construction should conform to the following requirements:

- (a) All timbers and planking to conform to the density rule requirements.
- (b) All timbers including hold ceiling, except floor and frame timbers, to be of Selected Common grade.
- (c) All planking including that for calked bulkheads, shaft tunnels, Poop, Bridge and Forecastle ceiling, plank-sheers and rails to be No. 1 Ship Plank.
- (d) All calked decking to be of the grade known as Ship Decking, vertical grain, and cut clear of the pith or center of the tree.
- (e) Floor and frame timbers to be No. 1 Common or better, all heart where the sizes necessary will permit.
- (f) Sills, plates, studs, beams and other construction members of erections to be Selected Common.
- (g) Tongue and Groove material exposed to the weather to be Fir Finish of the grade known as No. 2 Clear and better, and should be kiln dried.
- (h) Tongue and Groove material used for canvas covered decking and the inside ceiling of houses is preferably Fir Finish of the grade known as Selected Flat Grain, kiln dried.
- (i) Tongue and Groove material for hold bulkheads and bunkers to be Selected Common, edge grain, kiln dried.

White Oak timbers for ship construction to be selected stock from the grade of construction oak timbers and should conform to the grading requirements of the National Hardwood Lumber Association, which has formulated detail specifications for a number of the special items for which White Oak is particularly desirable.

Cypress timbers for ship construction should where pos-

sible be Heart Select Common as graded by the Southern Cypress Manufacturers' Association; tongue and groove material to be grade B or better, and mold material to be Select Common.

The hardwoods generally should conform to such grading of the National Hardwood Lumber Association as meets the needs of the particular service. General requirements are that they should be square or rectangular if hewn, well seasoned, straight and sound, and free from injurious shakes, worm holes, excessive sap, large or unsound knots and other injurious defects.

DENSITY REQUIREMENTS FOR SELECT STRUCTURAL YELLOW PINE

The density requirements for Select Structural Yellow Pine timbers are of particular interest because they are largely the result of a method devised by the U. S. Forest Service which was adopted by the Southern Pine Association in 1915 and also adopted and made a standard of the American Society for Testing Materials; and because the Forest Service has recommended the same requirements for Douglas Fir for shipbuilding purposes. The requirements as adopted by the Southern Pine Association are below quoted. Instructions are given as to how to measure the rings in cases where the pith or core of the tree is or is not present.

"Dense Southern Yellow Pine shall show on either end an average of at least six annual rings per inch and at least one-third summer wood, or else the greater number of the rings shall show at least one-third summer wood, all as measured over the third, fourth and fifth inches of a radial line from the pith. Wide-ringed material excluded by this rule will be acceptable, provided that the amount of summer wood as above measured shall be at least one-half.

"The contrast in color between summer wood and spring wood shall be sharp and the summer wood shall be dark in color, except in pieces having considerably above the minimum requirement for summer wood."

It has been established by test that the density or dry weight of most woods has a direct bearing upon their strength, and that for Southern Yellow Pine the above quoted density rule together with the standard requirements as to defects ensure the obtaining of suitable timbers for ship construction even if they are cut from Cuban Pine, Short Leaf Pine or Loblolly Pine.

DENSITY REQUIREMENTS FOR DOUGLAS FIR

The following somewhat similar density requirements were adopted in 1919 by the West Coast Lumbermen's Association. The methods of measuring the rings differ from those adopted by the Southern Pine Association.

"Dense Douglas Fir shall show on one end or the other an average of at least six annual rings per inch and at least one-third summer wood measured over three inches on a line located as described hereinafter. Coarse grained material, excluded by this rule, shall be acceptable provided that the amount of summer wood measured as described shall be at least one-half. Material in which the proportion of summer wood is not clearly discernible shall not be accepted."

"Any timber whose least dimension is less than five inches shall not show the pith (heart) on the inspection end; pieces whose least dimension is five inches or more, may contain the pith."

Apart from density specifications the grading is largely a question of the presence of knots, shakes, cross grain, wane and other defects; so that these defects are pretty well disposed of by the selection of the proper grade. There are therefore only two classes of defects which call for specific mention here.

One of these is wane, which is either bark on the corner of the piece as sawed for delivery to the purchaser, or the absence of the corner. It is evident that wane does not affect the quality of the wood and that it may be allowed on all

pieces where the absence of the amount of the corner concerned would not be detrimental to the service of the timber when in place, or where that part of the piece would be cut away in the shaping and fitting of the timber. Such an allowance is a help to the producer and well worth noting in timber schedules that are at all difficult. The notes should state the amount of wane allowed or there should be sketches to show the finished timber in way of it.

The other class consists of defects of any nature which will work out when the timber is shaped, such as splits, shakes, large and loose knots, etc.; and the same action can be taken with regard to them. Examples of this are:

Beams where a considerable amount is cut away by the camber of the upper surface.

Clamp timbers that are adjacent to the ceiling.

Hold ceiling where against ceiling of less thickness.

Keelsons bevelled down to meet the ceiling.

Hatch coamings.

Hatch strongbacks, which have two corners cut off.

Stem, stem gripe, knightheads, frame timbers with considerable shape, and other timbers that require shaping.

The ends of all timbers that are scarfed or spliced.

STRENGTH

A comparison of woods on the basis of their strength is not of much value to the naval architect, shipowner, or shipbuilder in the general course of events, but it becomes quite important when he finds it necessary or desirable to substitute another kind of wood for one which has been previously determined upon and the dimensions of which have been settled by experience, classification society approval, or other good standards. In such cases the following list, prepared by the U. S. Forest Service particularly for shipbuilding, is at least a good guide as to what may be allowed or required. The increase or decrease stated applies to one dimension only.

	Increase Percent	Decrease Percent
Live Oak	—	20
Hard Maple	—	20
White Oak	—	20
Red Oak	—	20
Beech	—	20
Birch	—	20
Elm	—	None
Red, Black and Cotton Gum	None	—
Douglas Fir	20	—
Tamarack or Hackmatack	20	—
Port Orford Cedar	20	—
Chestnut	25	—
Bald Cypress	25	—
Norway Pine	30	—
Alaska Cedar or west coast Yellow Cypress	30	—
White Pine	50	—
White, Red, Black and Sitka Spruce	50	—
White Cedar or Arborvitae	80	—

In the preparation of this list the Forest Service gave the greatest consideration to those properties which indicate the ability to hold fastenings or prevent mashings, such as hardness and compression perpendicular to the grain, although the other mechanical properties were also considered.

With the usual shipbuilding woods the presence of sapwood is not a factor in the strength as long as it remains sound, for the Forest Service tests have proved it to be as strong as heartwood.

LENGTH OF LIFE

The best guides to the probable length of life of the various woods used in shipbuilding in this country, when incorporated into the structure of a vessel, are a table prepared by the U. S. Forest Service along the lines of the tables that may be found in the Wood Ship Rules of the various classification societies and the classification society tables. The figures of the Forest Service are chiefly comparative, being based on the assumption that the life of seasoned true white oak is 15 years wherever located in the vessel. Other woods are compared with white oak, taking their location into

Table of Comparative Life of Woods as Framing Timbers

	Floors 3/5 L. Amidships		Naval Timbers and First Futtocks		Second Futtocks		Third Futtocks		Top Timbers and Rail Stanchions		
	F. S.	Class. Soc.	F. S.	Class. Soc.	F. S.	Class. Soc.	F. S.	Class. Soc.	F. S.	Class. Soc.	
Seasoned True White, Burr and Post Oaks	15	11	15	11	15	11	15	11	15	11	Average of 2 of the 3 classification societies
Seasoned other White Oaks, includes Cow Oak, Overcup Oak, Swamp White Oak, Chinguapin Oak and others.....	15	8 $\frac{2}{3}$	15	8	12	8	12	8	12	8	
Seasoned Red and Black Oaks, includes Red Oak, Yellow Oak, Pin Oak, Willow Oak, Black Jack, Spanish Oak, Texan Oak, Scarlet Oak, Turkey Oak, Water Oak, Laurel Oak and Shingle Oak	15	9	15	8	12	3	8	3	0	3	Listed by only 1 of the 3 classification societies
Seasoned Live Oak.....	15	12	15	12	15	12	15	12	15	12	
Seasoned Elm, includes Cork or Rock Elm, Slippery Elm and White Elm....	12	8 $\frac{2}{3}$	12	7	8	6 $\frac{2}{3}$	0	6 $\frac{1}{3}$	0	6 $\frac{1}{3}$	Limited to Rock Elm by 1 of the 3 classification societies
Seasoned Hard Maple.....	15	8 $\frac{1}{3}$	15	3 $\frac{2}{3}$	12	3 $\frac{1}{3}$	0	3	0	3	
Seasoned Birch, includes Sweet or Black Birch and Yellow Birch.....	15	8 $\frac{1}{2}$	15	7 $\frac{1}{2}$	12	7	8	6 $\frac{1}{2}$	0	6 $\frac{1}{2}$	Avg. of 2 of the 3 classification societies for Yellow Birch
Seasoned Beech	15	8 $\frac{2}{3}$	15	5 $\frac{2}{3}$	12	3 $\frac{2}{3}$	0	3	0	3	Listed by only 1 of the 3 classification societies
Seasoned Black Gum and Red Gum.....	12	8	12	7	8	6	0	5	0	5	Listed by only 1 of the 3 classification societies
Seasoned Chestnut	15	9	15	10	15	10	15	10	15	9	Listed by only 1 of the 3 classification societies
Dense Southern Yellow Pine, includes Longleaf, Shortleaf, Loblolly, Cuban and others, when dense.....	15	9	15	9 $\frac{2}{3}$	15	9 $\frac{2}{3}$	15	9 $\frac{2}{3}$	15	9 $\frac{2}{3}$	
Dense Douglas Fir.....	15	9	15	9	15	9	15	9	15	9	
Seasoned Bald Cypress.....	15	11	15	11	12	11	12	11	15	11	Listed by only 1 of the 3 classification societies
Seasoned Tamarack or Hackmatack.....	15	9 $\frac{2}{3}$	15	10	15	10	15	10	15	10	
Norway Pine.....	15	8 $\frac{2}{3}$	15	8 $\frac{2}{3}$	8	8 $\frac{2}{3}$	8	8 $\frac{2}{3}$	8	8 $\frac{2}{3}$	
White Pine	12	3 $\frac{2}{3}$	12	3 $\frac{2}{3}$	0	3 $\frac{2}{3}$	0	5	12	5	
Bay Shore Spruce.....	..	10	..	10	..	10	..	9 $\frac{1}{2}$	..	9 $\frac{1}{2}$	Avg. of 2 of the 3 classification societies
Common Spruce, includes Red Spruce, White Spruce and Sitka Spruce.....	12	5 $\frac{1}{2}$	12	5 $\frac{1}{2}$	0	5 $\frac{1}{2}$	0	5 $\frac{1}{2}$	12	5 $\frac{1}{2}$	Avg. of 2 of the 3 classification societies
Arborvitæ or White Cedar.....	12	7	12	7	8	7	8	7	12	7	Listed by only 1 of the 3 classification societies

account. As the framing of a wood vessel cannot be readily renewed and as it is the part where the substitution of local or other easily available woods assumes the greatest importance, a table has been prepared and is here presented to illustrate for that part of the construction the Forest Service figures as compared with the average of figures given by three classification societies, which show their comparatively recent or present practice. It will be evident from this table how important it is to use the proper wood and why woods which are abundantly strong cannot be used in certain locations.

CAUSES OF DETERIORATION

Having arrived at some idea of the length of efficient service to be expected from any species of wood in any location on the vessel there are five main factors governing the life of the material actually used—the presence of sapwood, seasoning, preservative, ventilation and contact with woods of shorter life.

Decay is caused by fungi which dissolve the wood substance and use it for food; and they require a great deal of moisture in order to begin work, even with the so-called "dry rot," which requires less after it has developed.

Sapwood is liable to be destroyed by decay under condi-

tions where heartwood remains sound; and if decay starts in the sapwood the heartwood is likely to be quickly affected also. For this reason the floors and framing of ceiled wood vessels and timbers in any location particularly favorable to decay should either be all heart or be thoroughly protected by the use of preservative. The Forest Service has made the following helpful recommendations regarding the use of sapwood:

1. As far as possible all trimming of timber at the shipyard should take place on the sapwood faces alone.
2. Where possible sapwood faces should be set so as to be always exposed to the air.
3. As far as possible all surfaces of timbers in contact should be free from sapwood.

The purpose of a preservative is to produce what organisms which cause decay might call denatured wood. The preservative is either a salt pickle or a creosote solution and will be dealt with in a separate paper. Their relative merits are pertinent only to the extent that these merits are dependent upon the nature of the wood to be used.

About the middle of 1918 one of the classification societies inaugurated the procedure of calling for the salting of wood vessels where the framing was of oak and the use of a cre-

sote preservative where the framing was of yellow pine or Douglas fir. This is probably because oak has naturally a higher moisture content than the other woods which renders it more easy to keep the oak pickled with brine, whereas the woods of low moisture content are more efficiently protected by creosoting.

Special attention to ventilation of vessels in service is particularly necessary at the ends of the holds, the framing of ceiled wood vessels, and other places that are always or generally closed in. Lack of proper ventilation leads to those moisture conditions that are favorable to decay and even seasoned timber will absorb this moisture. This applies to all species of wood, and explains the necessity for proper ventilation when a vessel is laid up.

Trouble from contact with woods of shorter life results from the fact that decay in the inferior wood will start decay in the other wood under conditions where the better species might have lasted for years without such decay. Examples of this are premature decay from the use of mixed framing and from the use of short-lived knees.

SEASONING

The principal value of seasoning is to guard against decay by reducing the moisture in the wood below the amount necessary for the life of the decay producing organisms. Furthermore green timber will not satisfactorily take a brush treatment of creosote preservative.

A glance at the headings of the table here presented will show that seasoning is definitely called for for most of the woods but that it is not so specified for the two principal woods used in wood ship construction, Southern Yellow Pine and Douglas Fir. This is because they contain less moisture to start with and because the soft woods season more rapidly than the hardwoods; so that Yellow Pine and Douglas Fir will season sufficiently as far as decay is concerned in the time required for all processes up to closing the timbers in. The sapwood of these species is, however, very wet and where present to any considerable amount necessitates the seasoning of the timber. Most softwoods have much more moisture in the sapwood than in the heartwood while the moisture in the hardwoods is fairly uniform throughout.

The following figures from Bulletin 556 of the Forest Service are of interest in a consideration of seasoning. The values are from tests of small clear pieces and are the average of the heartwood and sapwood for the species. They show the weight of water in the wood as a percentage of the oven-dry weight of the wood.

Percent of Moisture in the Green Wood

Chestnut	122	Western White Pine....	58
Eastern Hemlock	105	Black Gum	55
Bald Cypress	87	White Cedar	55
Pitch Pine	85	Norway Pine	54
Red Oak	84	Sitka Spruce	53
Red Gum	81	Hackmatack (Tamarack) ..	52
California Eucalyptus ..	79	Port Orford Cedar....	52
Eastern White Pine....	74	Live Oak	50
Western Hemlock	71	Rock Elm	50
Loblolly Pine	70	Longleaf Pine	47
White Oak	68	Cuban Pine	47
Yellow Birch	68	White Spruce	46
Shortleaf Pine	64	White Ash (forest	
Yellow Poplar	64	grown)	43
Beech	62	Red Spruce	43
Black Birch	61	Black Locust	40
Hard Maple	60	Western Red Cedar....	39
Shagbark Hickory	60	Douglas Fir (coast)....	36

Seasoning is also of value to allow of a slight swelling when placed in service and thus ensure tight joints and contrariwise it is of value to guard against subsequent shrinkage and open joints. Boards for watertight bulkheads and for joinerwork should invariably be kiln dried.

Shrinkage along the grain is generally inconsiderable. It is about three-fifths as much in the direction across the annual rings, or radially of the log as it is paralleling the

annual rings or tangentially of the log, and therefore decking, planking, hold ceiling, etc., should where practicable be set edge-grain, or with the annual rings running as nearly parallel as possible to the calking edges. This is particularly important with material for watertight bulkheads. The volume shrinkage is a combination of the tangential and radial shrinkage, and figures for this for some of the woods are given under the head of Treenails.

Where the pith or center of the tree is present in pieces of small cross section like decking, warping and twisting during seasoning are almost certain to take place.

Painting the interior of a wood vessel with an oil paint plugs the pores of the wood and interferes with seasoning, though a proper preservative does not do this. Dry rot is almost certain to take place if the timber is green or partially dry when painted.

In view of the foregoing and for other reasons that will be readily apparent the Forest Service has made the following recommendations bearing upon the subject of seasoning and decay:

1. The timber for each ship should be cut as soon as possible and piled under cover in a manner that will allow each piece to be thoroughly ventilated until used.
2. Dense hardwoods, hard to dry, may be kiln-dried by any approved method.
3. Where dense hardwoods, hard to dry, are air-seasoned, the ends of the pieces should be painted with an approved paint.
4. No timber should be allowed to lie in contact with the soil.
5. It is preferable that timber should be laid edge-grain.
6. Material of small cross section, like decking, should be cut clear of the pith.
7. All ships should be thoroughly ventilated.
8. Interior hull-painting should be omitted.

HOLDING POWER FOR FASTENINGS

The hardwoods naturally have greater holding power for fastenings than the softwoods, and the different species group themselves roughly about as listed under the head of strength. Tests made with spike fastenings indicate that beech is somewhat superior to white oak, while red oak, ash and elm are about on a par in this respect somewhat below white oak. The Forest Service estimates from tests made to date that for equivalent strength the fastenings in dense Douglas Fir should be about $12\frac{1}{2}$ percent greater in diameter than in dense Yellow Pine or that a correspondingly greater number should be used.

TIMBER SCHEDULE SIZES AND SURFACING

Standard lengths for ordering timbers and much of the lumber are multiples of 2 feet and odd lengths are usually charged for as being the next even length above. This can be overcome with short lengths by ordering two or more as one stick or allowing the mill to furnish them in that way.

All thicknesses less than 1 inch are charged for as 1 inch.

Where the material is surfaced at the mill the gross size is charged for, and a proper allowance for this when not definitely standardized is $\frac{1}{4}$ inch for each face surfaced. The mills will sometimes accept schedules where the allowance is only $\frac{1}{8}$ inch for each face surfaced, but this will mean that on most of the timbers and planking they will have to use larger sawed sizes than they are paid for. The standardized allowances for surfacing of tongued and grooved lumber may be obtained from the sketches of the various designs as published by the lumber associations.

Where unsurfaced items are furnished hewn they should run a full inch over the specified gross size and should be distinctly specified to be square edged and of uniform size throughout, unless cut to some special pattern or templet.

The use of templets or sketches will often be of great assistance to the mills in filling difficult schedules and where a log

is not straight the full benefit of the curve can thus be obtained. The advantage of such sketches in connection with defects has been previously mentioned.

All unnecessary surfacing should be avoided on the ground of the additional strength of the unsurfaced timbers and on the ground of economy; and for the latter reason timber schedules should not call for the surfacing of items whose

surface will have to be afterwards shaped off at the shipyard. Examples of items which do not require surfacing are the frames of ceiled wood vessels, end framing, dead-woods, etc. Examples of items which require shaping are the stem, knightheads, apron, stern post, rudder blade timbers and rails.

(To be continued.)

Steamship Manulani Inaugurates New Service

**Matson Navigation Company Freighter Arrives in Philadelphia With
Cargo of Molasses, Sugar, and Pineapples Valued at \$1,750,000**

THE recent arrival of the S. S. *Manulani* of the Matson Navigation Company in Philadelphia has directed the attention of eastern shipping men to this progressive Pacific Coast Company. Starting in 1882, when Captain William Matson entered the Hawaiian trade with the 185-ton sailing ship, *Emma Claudina*, this company has grown until now, aside from its smaller coastwise vessels, it operates eleven large steamers with a total tonnage of approximately 150,000, which trade between San Francisco and the Hawaiian Islands and are now beginning to serve eastern ports through the Panama Canal.

The peculiar history and conditions of the Hawaiian Islands are one cause of the success of this company. Cast up from the bottom of the sea less than 800 years ago, this newest inhabited land produces but two crops, sugar cane and pineapple; but it produces these in great abundance. In 1920 the sugar crop amounted to 600,000 tons, while the pineapple crop aggregated 200,000 tons, a supply for the entire Pacific Coast.

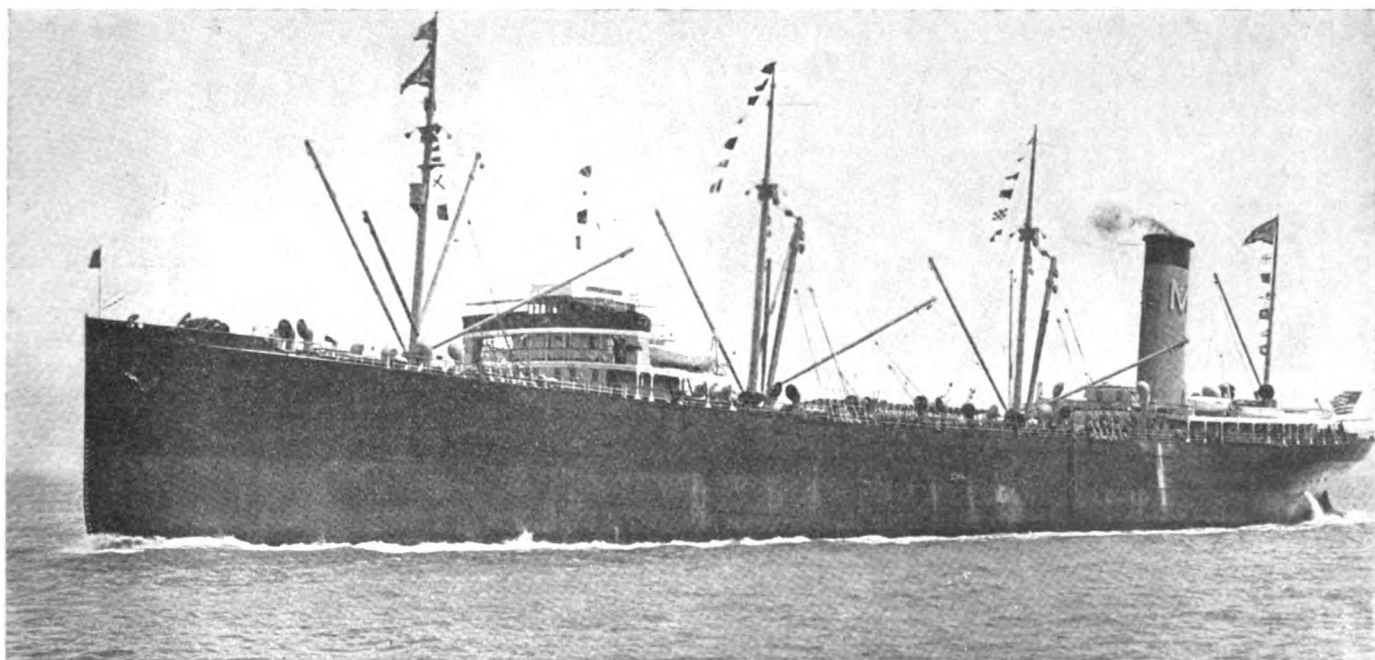
In return, every article used by the 256,000 inhabitants of the islands, from lumber and fuel to automobiles and clothing, must be imported. And this carrying trade is handled almost exclusively by the Matson Navigation Company. The interchange of such commodities offers these vessels a great advantage; namely, a full cargo waiting at each end of a trip permitting a return voyage just as soon as one cargo can be unloaded and another taken on.

With so much freight to handle these vessels must run on a schedule as close as that of an express train. A full crew of stevedores waits on the dock for a ship to arrive, with warehouses and freight cars ready to receive the incoming cargo; and the new cargo is piled ready to load, as every hour's delay means a loss of several hundred dollars.

With such operation only the most efficient and reliable machinery must be used. In 1915 the Matson Company gave the Westinghouse Electric & Manufacturing Company the contract for the propelling equipment for their new passenger and freight steamer *Maui*. This vessel, the largest in the Pacific trade, made a number of runs before being commandeered by the Navy for war transport service. In the latter she operated under gruelling conditions for the period of the war and then resumed her trans-Pacific run.

In all this her performance was so satisfactory that when the Matson Company, released from wartime restrictions, embarked on its new policy of expansion and let the contract for two of the finest and most modern freighters in the world, Westinghouse geared turbines were specified as the propelling equipment.

These vessels, the *Manulani* (Bird of Paradise) and *Manukai* (Bird of the Sea), which were built by the Moore Shipbuilding Company, Oakland, Cal., are 497 feet long. Each has a deadweight cargo capacity of 14,000 long tons, equivalent to the freight carried by 34 trains of 30 cars each.



New Matson Freighter Manulani on Her Trial Trip

Several unusual and interesting features are embodied in their construction. The engine room is located aft leaving the whole space forward clear for cargo. The hatches are unusually large and numerous which greatly facilitates cargo handling.

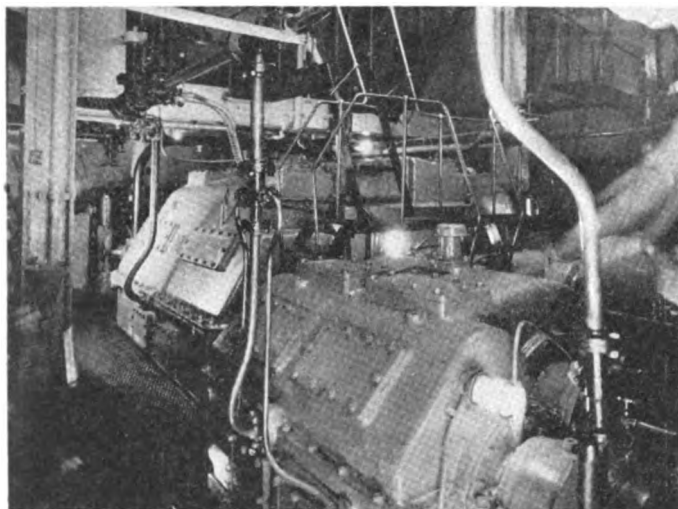
The double bottoms of the vessels form tanks in which fuel oil for the islands is carried on the outbound voyage.



Boiler Room

This is discharged at the islands, the tanks are rapidly cleaned by high pressure steam jets and are then refilled with molasses for the return voyage. The masts are hollow and extend down into these tanks, so that they act as relief pipes for the contents of the tanks, if expansion occurs or gas is given off.

On the return voyage, besides molasses, the vessels carry sugar and pineapples, the total value of one such cargo being



Engine Room

about \$1,750,000. Special refrigerating and ventilating systems have been provided to preserve meats and fish, to keep the tropical fruit from sweating and to keep the sugar dry.

On her maiden voyage, the *Manulani* broke all Pacific records for freighters when she made the voyage in 6 days, 12 hours and 22 minutes, at an average speed of 13½ knots. Her designed full load speed is 12½ knots.

The machinery which drives each of these vessels consists of one set of Westinghouse 5,000-shaft horsepower divided flow turbines, which drive the propeller through a double

reduction, floating frame gear. Each step of the reduction is in a separate case, the first reducing the turbine speed of 3,600 revolutions per minute to 460 revolutions per minute; and the second, the latter speed to 90 revolutions per minute.

A special feature of the turbines is the impeller type governor which automatically keeps the propeller from racing when the vessel is light or the screw comes out of water. It operates by means of oil under pressure, the pressure being maintained by a small centrifugal pump mounted on the turbine shaft. As this pressure varies directly with the turbine speed, a very sensitive and reliable governor is obtained.

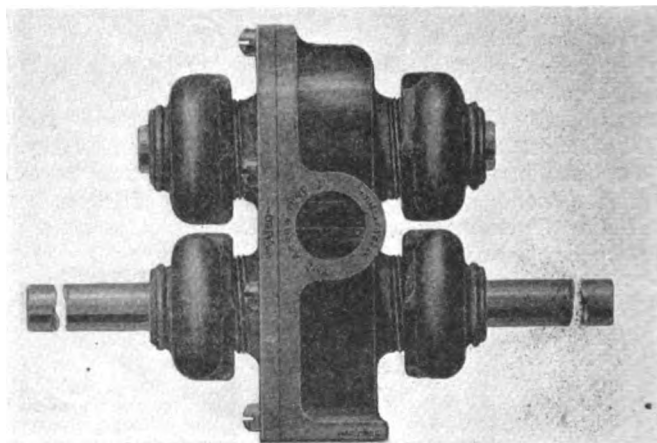
In addition to the propelling equipment, the Westinghouse Company also furnished the condensate pumps, ejectors, and the design for the condensers, which had to be specially adapted for using circulating water of high temperatures.

The average consumption of fuel per shaft horsepower hour on the *Manulani's* first round trip was less than a pound of oil, which is an excellent record for this class of vessel.

Rotary Geared Pump for Cooling Marine Engines

A NEW line of rotary geared pumps with self-lubricating packing glands for marine service has been designed by the Arrow Pump Company, Detroit, Mich. This type of gland construction is intended to reduce leakage and eliminate the possibility of scored shafts and worn bearings due to faulty lubrication.

The packing is located between the water being pumped and the bearings so that neither water nor foreign matter of



Arrow Geared Rotary Pump

any kind can enter the bearings. A film of oil is at all times maintained on the bearings, so that the shaft as well as the bearings are properly lubricated at all times. The glands are arranged in combination with an adjustment nut and an oil reservoir, to permit the use of a ring oiling device. In this way a constant supply of oil is fed to the glands, making it practical to use them as bearings.

The pump illustrated is arranged for a direct engine drive through gears, but pumps of similar construction can be fitted for belt and motor drive.

F. G. FRIEZER, formerly in charge of the export and import movements of freight for the Canadian-Pacific Railroad in New York, has been appointed as assistant to W. J. Love, manager of the traffic department of the Shipping Board. Mr. Friezer will have charge of all inland competitive rate matters.

Questions and Answers for Marine Engineers

Inquiries of General Interest Regarding Marine Engineering and Shipbuilding Will Be Answered in This Department

Conducted by James L. Bates

This department is maintained for the service of practical marine engineers, draftsmen and shipbuilders. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Stresses in Stack Guys

Q. (1132).—In the case of a stack supported by six guys located as shown in the illustration I desire to find the stress in each of the guys in order that the guys and fittings may be made sufficiently strong. I usually consider the stress in the thwartship guys equal to the sum of the stresses caused by (1) ship heeled to 30 degrees (static), (2) effect of wind pressure of 60-knot velocity on stack, (3) dynamic force due to rolling. In the second condition I have used the formula given in "Strength of Ships" by A. J. Murray, page 361, and applied on page 364. In the third condition I have also followed Mr. Murray's formula as used on page 364, only I am rather dubious as to the real value of the result obtained for the period of roll and the position of the center of oscillation must be assumed. I have nothing definite to base my assumptions on as the ship is not yet built. Having got this far I am at a loss how to distribute this thwartship stress among the four guys, namely, 1, 2, 3 and 4 (see sketch.) I would be very pleased to know your method of handling this problem. The fore-and-aft stress I usually treat in the same way as the thwartship stress. What is particularly puzzling to me is how to distribute a resultant stress among more than two guys.

A. (1132).—A rigid solution of this problem, involving, as it does, the determination of the intensities of the stresses in four independent members, is not possible. A very clear and complete discussion of the resolution of concurrent and non-concurrent parallel and non-parallel coplanar forces and the number of unknowns that are determinate by both the algebraic and the graphic method is found on pages 15-40 of "Modern Framed Structures," Part I, by Johnson, Bryan and Turneure (John Wiley and Sons, Inc.). The problem may be solved approximately, however, under certain justifiable assumptions and the stress in each of the several guys determined with an accuracy probably equalling that which obtains in the calculated total of the forces acting on the stack.

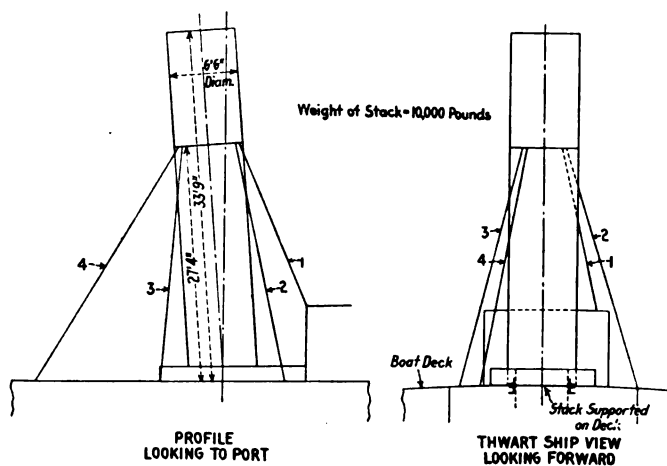
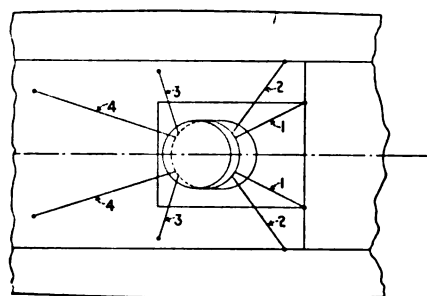
Consider, first, only the transverse forces acting on the stack, viz., the static weight of the stack when the vessel is heeled, the wind pressure and the dynamic effect due to angular acceleration when rolling. Assume that the resultant of these forces acting in a transverse direction perpendicularly to the stack has been determined and that its point of application is at the intersection of the transverse and fore and aft axis of the stack. Denote this resultant by F . For facility of discussion, we will deal at present with only the components of the guy stresses normal to the stack, or, in other words, we assume that the lines of action of the guys lie in a plane perpendicular to the stack. If now F , the transverse resultant force, is not contained in the assumed plane of the guys, it should be reduced to that plane by taking moments about any properly selected point, as the base of the stack for example.

Now, since every force may be resolved into two component forces, we will assume F divided into two parts, one of which bisects, approximately, the angle between guys 1 and 2 which we denote by F_1 ; the other component of F denoted by F_2 , bisecting, similarly, the angle between guys 3 and 4. F_1 and F_2 are assumed to be concurrent forces with F . The direction of F_1 and F_2 having been determined, their intensities may readily be found by a single resolution. It will be seen at once that whether the forces acting through F_1 and guys 1 and 2 are concurrent or non-concurrent, no serious

error will result from regarding them concurrent and the stresses in guys 1 and 2 are evidently the components of F_1 . Similarly, the stresses in guys 3 and 4 are components of F_2 .

Since we have assumed the guys acting in a plane normal to the stack, the intensities thus found are only components of their true intensities. These latter are readily found when we remember that the other components are parallel to the stack and perpendicular to the component stresses found from F_1 and F_2 .

It is observed that the angle in the plan view between guys 1 and 2 is more acute than between 3 and 4 and also



Sketch Showing Arrangement of Guys

that the angles made with the stack vary widely for the different guys. This will give quite different intensities in the guy stresses. If it is desired that the guys should all be made one size, a reasonably high factor of safety should be allowed in order to care for errors in assumptions made and for unequally stressed members as will be later shown to be unavoidable.

It is to be observed that if the directions of the assumed components of F (F_1 and F_2) do not make equal angles with the fore and aft axis of the stack, their fore and aft components will be unequal and an unbalanced force will exist which tends to urge the stack in either a forward or an after direction. Effort should be made to reduce this to a minimum by a proper choice of points of attachment and levels of the guys.

In order to eliminate unbalanced forces which prevent equilibrium both of translation and rotation, the several pairs of guys should have a common point of attachment to the stack, and the components of F (F_1 and F_2) should be assumed symmetrically located with reference to the center of the stack. Further, if it is desired that stresses induced in the guys should be equal under the action of the transverse forces, then the guys must also make equal angles with the stack and the angles between guys 1 and 2 and 3 and 4 be bisected by F_1 and F_2 respectively.

You are entirely correct in treating the fore and aft forces similarly to the transverse forces. While the fore and aft are very much less than the transverse forces, it must be borne in mind that they may act simultaneously, thereby augmenting the guy stresses very appreciably.

Assuming the resultant of the fore and aft forces as having been determined and denoting the sum by f , we now impose for it the same conditions as to the point of application and plane of action as for F ; the assumption as to the guys remaining the same as for transverse forces. The force f is then resolved into two equal components, one of which is co-incident in direction with F_1 or F_2 . The remaining operations are performed in the same order and manner as previously described. Time and labor may be saved by compounding the assumed components of F and f before making further resolutions.

It will be seen that under the combined action of transverse and fore and aft forces, the stresses in guys 1 and 2 differ from those in 3 and 4, on the same side of the stack alternating in intensity with the pitch of the vessel while the stresses in corresponding members on opposite sides of the stack are unequally stressed, the stresses on the one side being induced by fore and aft forces only. Under these conditions by no possible arrangement of the guys can equal and constant forces be maintained in several guys.

In the calculation of the force due to angular acceleration, the center of oscillation may be assumed at the waterline without serious error in results.

Relative to the value of the period of roll to be expected, reference is suggested to pages 162 and 163, "Shipbuilding Cyclopedia," published by the Simmons-Boardman Publishing Company, New York City. In case the data therein tabulated do not apply to the type or size of ship you have in hand, a fair approximation to the time for a single oscillation may be obtained by the use of the formula

$$T = .554 \sqrt{\frac{K^2}{GM}}$$

in which T is the time in seconds for a single oscillation, GM is the metacentric height in feet and K is the radius of gyration in feet about a longitudinal axis through the center of gravity of the ship. The complete period will then be $2T$. You probably have calculated the value of the metacentric height. K may be taken as from $\frac{2}{3}$ to $\frac{3}{8}$ of the beam of the vessel.

Yacht Design—Underwater Characteristics

Q. (1136).—What principal underwater form characteristics would you suggest for a proposed steam yacht intended to have a maximum sustained speed of 17 knots and a trial displacement of 750 tons? The length is limited to 200 feet over all. No limitations other than those imposed by good design are placed on draft and beam.

A. (1136).—In the statement of your question, no reference has been made either to cruising conditions or to the vertical location of the center of gravity of the yacht. The former might affect the selection of the underbody coefficients and the latter the relationship between inertia of load water plain, draft, etc.

In all seagoing vessels it is desirable to secure as easy a motion in a seaway as practicable. A low value of metacentric height is conducive to this end. Making a slight

allowance for loss during the development of the design and building, assume 2.25 feet as the design value of the metacentric height. Let the draft then be assumed as 8 feet to 9 feet and the height of center of gravity above the bottom of the flat plate keel 12 feet. The height of metacenter should then be 14.25 feet.

If it be assumed that we are to have a cruiser type of stern and straight stem in order to secure the advantage from the driving standpoint of the maximum length of waterline, our prismatic or longitudinal coefficient and area of midship section may vary as follows:

Prismatic Coefficient	Area of Midship Section
.54	242.6
.55	238.2
.56	234.0
.57	230.0
.58	225.0
.59	222.0

If it is decided to design primarily for the maximum speed, 17 knots, a prismatic coefficient of 0.58 or 0.59 would be suitable. If it is desired to cruise much of the time at speeds of 12 to 14 knots or less, 0.54 or 0.55 would be better. The reason for this is that the lower value of the coefficient gives easier driving at these latter speeds but for a speed approaching 17 knots the power curve would be rising rapidly and at 17 would probably be considerably higher than if the higher values of the coefficient were used.

Let us assume that a value for the prismatic coefficient of 0.58 is decided on. Then the area of midship section will be 226 square feet. We then have for a reasonable form of waterline and a height of metacenter of 14.25 feet the following taken from the Basic Design Section of the "Shipbuilding Cyclopedia":

Draft	Beam	Midship Section Coefficient	Area Midship Section
8	30.2	.86	208
8.5	30.6	.86	224
9.0	31.	.86	240
7.5	30.5	.90	203
8.0	31.0	.90	222
8.5	31.5	.90	241

We may then use either of the following combinations:

Draft, 8.5 feet; beam, 30.6 feet; midship section coefficient, 0.86 or Draft 8.0 feet; beam, 31 feet; midship section coefficient, 0.90.

These solutions are strictly accurate when the load waterline functions are read from pages 179 and 180 of the "Shipbuilding Cyclopedia" corresponding to the value of the prismatic or longitudinal coefficient selected.

The assumptions made result in a boat having a large beam to draft ratio. If the design of the ship could be such as to reduce the height of center of gravity to 11 feet and a metacentric height of 2 feet were assumed, we could use the following:

Draft, 9 feet; beam, 29 feet; midship section coefficient, 0.86

This would probably result in a more satisfactory vessel.

CORRECTION.—In answer to Q. (1125), published on page 562 of the July issue, reference was made to "General Instructions for Painting and Cementing Vessels for the United States Navy." We are informed that the Bureau of Construction and Repair is no longer in a position to supply these pamphlets.

CORRECTION.—The article on "Diesel Electric Propulsion," published on page 631 of the August issue of MARINE ENGINEERING, was written by Mr. Walter E. Thau, engineer of the Westinghouse Electric & Manufacturing Company, and not by Mr. G. B. Bassett, as stated. Mr. Thau and his company have taken a leading part in the development of the Diesel electric system and we regret that proper credit was not given for this excellent article.

PERSONAL MENTION

JOSEPH W. POWELL, until recently vice-president of the Bethlehem Shipbuilding Corporation, Ltd., was recently offered by Chairman Lasker the senior vice-presidency and general management of the Emergency Fleet Corporation at a large salary. Mr. Powell could not see his way clear to accept this position, but has been prevailed on by the chairman and the Shipping Board to undertake the organization for the Emergency Fleet Corporation of the financial, accounting and sales departments, including the sale of ships, shipyards, etc., and the organization of the general offices of the corporation. Mr. Powell, who has refused to accept any salary for this service, is undertaking this work as a public service and will join the organization about September 1. Mr. Powell is forty-four years old, a Naval Academy graduate, and was a member of the Construction Corps of the Navy from which he resigned in 1906 to accept a position with the Wm. Cramp & Sons Ship & Engine Building Company. In 1914, he became president of the Fore River Shipbuilding Corporation, and in 1917 was put in charge of the five shipbuilding properties belonging to the Bethlehem interests. He organized and operated these properties throughout the war, and until his retirement early this year. The Bethlehem shipyards, under Mr. Powell's leadership, employed at one time seventy thousand men and produced, when at their maximum, vessels at the rate of one ten-thousand ton ship every other day for a period of one year.

EDWARD B. GERMAIN, formerly general manager of the Harlan plant (Wilmington, Del.) of the Bethlehem Shipbuilding Corporation, Ltd., has been appointed manager of



E. B. Germain

sales of this corporation with offices at 111 Broadway, New York. Mr. Germain was graduated from the Massachusetts Institute of Technology in 1913. Until the fall of 1917 he was connected with the Aberthaw Construction Company, Boston, Mass., first as contracting engineer and later as manager. In 1917 he became connected with the Bethlehem Shipbuilding Corporation, Ltd., serving as general manager of the Moore plant, Elizabeth, N. J., the Naval Turbine plant, Buffalo, N. Y., and the Naval Boiler plant, Providence, R. I. Immediately after the war he was transferred to Wilmington, Del., and served as general manager of the Harlan plant until July, 1921, when the Bethlehem Shipbuilding Corporation, Ltd., decided to concentrate its commercial offices in New York, at which time he was placed in charge of this office with the title of manager of sales.

WILLIAM H. COLLINS, formerly assistant superintendent of hull construction at the Harlan plant (Wilmington, Del.) of the Bethlehem Shipbuilding Corporation, Ltd., has been appointed superintendent of hull construction at this plant.

WILLIAM A. QUADE, formerly general foreman of the machine shops at the Harlan plant (Wilmington, Del.) of the Bethlehem Shipbuilding Corporation, Ltd., has been appointed superintendent of machinery at this plant.

J. HARRY MULL, president and general manager of the William Cramp & Sons Ship & Engine Building Company, Philadelphia, Pa., has been elected treasurer of the Atlantic Coast Shipbuilders Association, vice Sidney Henry, resigned.

RALPH SOLLIT, a vice-president and director of the Munsey Trust Company, Washington, D. C., has been appointed assistant to Albert D. Lasker, chairman of the Shipping Board, to succeed John G. O'Laughlin, who has resigned to become vice-president of an exporting company in New York.

HON. CHARLES C. MCCHORD, chairman, Interstate Commerce Commission, Washington, D. C., has been selected chairman of the joint committee composed of three members



Hon. C. C. McChord

of the Interstate Commerce Commission and the United States Shipping Board, which has been appointed for the purpose of providing a liaison between the two governmental bodies and considering overlapping duties of the board and the commission due to amendments to the Interstate Commerce Commission Act and the passage of the Merchant Marine Act. Mr. McChord is a lawyer from Kentucky. He was born in that state in 1859 and educated at Center College, Danville, Ky. Until 1911 he practised law at Louisville, Ky., as a member of the firm of McChord, Hines & Norman.

On December 31, 1910, he was appointed a member of the Interstate Commerce Commission, of which he was elected chairman in March, 1915, and re-appointed on December 16, 1915. In the early part of his career he was prosecuting attorney for Washington County, Ky. At two different periods, from 1892 to 1895 and 1899 to 1907, he was chairman of the Kentucky Railroad Commission. From 1895 to 1899 he was a member of the Kentucky Senate and was the author of the McChord Railway Rate Bill enacted by the Kentucky Legislature. In numerous railway rate cases he has served as special counsel for the state of Kentucky. During the war he was a member of the Railway Wage Commission and arbitrator of the War Labor Board.

GEORGE H. WELLS, president of the Wells Steamship Corporation, New York, and formerly connected with the freight department of the International Mercantile Marine, has been appointed to the staff of W. J. Love in the traffic department of the United States Shipping Board, Emergency Fleet Corporation.

HARRY A. RUCK-KEENE has been appointed chief engineer surveyor to Lloyd's Register as from October 1, 1921, in succession to Dr. J. T. Milton, who is then retiring. Mr. Ruck-Keene was born on November 18, 1865, and educated at the Cheltenham College, England. He served his apprenticeship as an engineer at Sir W. Armstrong Mitchell & Company, Ltd., Elswick Works, Newcastle-on-Tyne, and R. & W. Hawthorne Leslie & Company, Ltd., St. Peters Works, Newcastle-on-Tyne, and remained with this latter firm until October, 1890, when he was appointed temporary ship and engineer surveyor to Lloyd's Register of Shipping. In June, 1892, he was appointed to Lloyd's permanent staff and since July, 1909, has been assistant to Dr. J. T. Milton. Mr. Ruck-Keene is chairman of council of the Institute

of Marine Engineers, a member of the Institution of Civil Engineers, Institution of Naval Architects, Iron and Steel Institute and the North East Coast Institution of Engineers and Shipbuilders.

D. EARLE BRUNDAGE, of Chicago, has been appointed advertising director of the United States Shipping Board to succeed Herman Laue.

R. S. JAMES, formerly with the Admiral Line and other steamship companies, has been placed in charge of the newly established Seattle agency of the Luckenbach Line.

A. G. LAURENT, formerly connected with the Pacific Mail Steamship Company, has been appointed manager of the Pan-American Line with headquarters at San Francisco, Cal.

W. B. KEENE, formerly acting director of the division of operations of the United States Shipping Board, has been appointed chief assistant to William J. Love, manager of the traffic department for the Shipping Board.

S. NAKASE, assistant manager of the New York office of the Nippon Yusen Kaisha, has been assigned to the company's head office and will be succeeded in New York by Kenkichi Sawai, who is authorized to sign documents for the company at the New York office.

CLIFFORD D. MALLORY has been elected vice-president of the United States Steamship Operators Association to succeed J. Barstow Smull, whose appointment as one of the three vice-presidents in charge of the operation of the Shipping Board fleet was announced in our last issue.

A. F. MACK has been appointed district manager of the United States Shipping Board, with headquarters at New York. For the present, Mr. Mack will have under his control Shipping Board operations at New York, Boston and Philadelphia. Practically seventy-five percent of American shipping centers in the district placed under his control. Mr. Mack is an experienced and able shipping man and will bring to the work assigned to him a wealth of knowledge that will be of the greatest value in the solution of the numerous problems which will arise in the office of the district manager. Mr. Mack was born in Cleveland, O., in 1863. For eighteen years he was with the Baltimore and Ohio and Santa Fe railroads, and in 1898 he entered the employ of the American Steel & Wire Company, serving with that company as freight agent in charge of all their traffic operation in the Cleveland District. He later became assistant general freight agent of that company and was assigned to New York where he had charge of its domestic and especially its export traffic, which under his direction assumed large proportion. Eventually this company affiliated itself with the United States Steel Corporation and one of the guiding policies of the latter corporation was the consistent exploitation of foreign fields along definite lines, for which purpose the United States Steel Products Export Company was organized in 1903. James A. Farrell, the head of that company, placed Mr. Mack in charge of the traffic and steamship departments of the Products Company. In 1916, Mr. Mack was offered and accepted the presidency of the Federal Shipping Company which was engaged in shipping operations with France. The Federal Company was later renamed and is now known as the Cosmopolitan Shipping Company. The operations of the Cosmopolitan Company cover not only France but Holland and the United Kingdom. The Cosmopolitan Company has operated as high as 28 ships and is now operating 20, and it is rated as one of the most profitable of the Shipping Board operators. As the United States Steel Products Company owned and operated as high as 25 steamers, Mr. Mack has had eighteen years' experience in the handling of ships from every angle, that of the owner, that of the charterer, and also that of an operator for the United States Shipping Board.

NEW BOOKS

Marine Rules

RECOMMENDED PRACTICE FOR ELECTRICAL INSTALLATIONS ON SHIPBOARD. Size, 6 by 9 inches. Pages, 89. Indexed and tabulated. New York, 1920: The American Institute of Electrical Engineers.

These rules are written to serve as a guide for the equipment of merchant ships with electrical apparatus for lighting, signalling, communication and power. They do not cover the main propulsion machinery. They indicate what is considered good engineering practice with reference to the safety of the personnel and of the ship itself as well as the reliability and durability of the apparatus.

As the distribution of electric energy for the auxiliaries on shipboard in present practice is usually made by direct current, the main body of the rules relates to direct current installation; but, in addition to this, information is also given concerning recommended practice for alternating current installation.

LETTERS TO THE EDITOR

Are You a Marine Engineer, Edison Standard?

The one hundred questions given by "Old Scotch" on pages 588 and 589 in the August issue of MARINE ENGINEERING are certainly a very good test and should arouse the interest of all who see them. Those who cannot answer all the questions should at least make an effort to secure the information about those they cannot answer and so add to their store of knowledge. It should set a fellow thinking and cause him to take an inventory of himself and see how he "measures up" with what may be considered standard. Personally, I hope to see a number of letters published giving the answers, so that I may learn something that I do not know at present.

CHARLES J. MASON.

Brooklyn, N. Y.

[EDITOR'S NOTE: Complete answers to the one hundred questions mentioned above will be published in the October issue of MARINE ENGINEERING.]

Appreciates Data Sheets

I wish to thank you for the ship data I have secured from you. At the same time I want to take the opportunity of expressing to you my appreciation for the form of presentation of data, pertaining to different types of vessels, such as that on the American passenger liner *George Washington*, on page 508 of the July issue.

I find this form is very complete with reference to marine equipment in terms of general information, propelling machinery, deck machinery, handling equipment and auxiliary machinery.

Not being a marine engineer I was somewhat at a loss to know just what this detailed data consisted of, and, as stated, such a complete form made it possible to make a complete list of the equipment for which it was my duty to make specific recommendations of lubricants, based on the analysis of the mechanical factors and the influence of operating conditions.

I agree with you that a complete list of information based on this form for all types of boats, would be invaluable primarily, due to its completeness.

Vacuum Oil Company.
New York.

R. P. TOBIN, Chief,
Technical Department.

Shipping and Ship Operation News

Changes in Steamship Routes—Passenger and Freight
Activities—Launchings and Other Notes of General Interest

Pacific Coast Shipping Shows Decided Betterment, With Return Full Cargoes on the Increase

Reports from Western Steamship Operators Indicate Institution
of New and Additional Freight and Passenger Routes
with Growing Demand for Cargo Space—
Steel, Lumber and Ore Moving

Pronounced activity in West Coast shipping circles and the movement of large and increasing cargoes by water are reported from Pacific ports, according to latest information received by MARINE ENGINEERING from Seattle, Wash. The institution of additional passenger and freight routes and the bringing to the fore of full cargoes are features of a noticeable improvement in trans-Pacific shipping conditions.

Assignment of the Shipping Board steamship *West Nilus*, formerly in the Seattle-Hawaiian trade of the Matson Navigation Company, to the Pacific Steamship Company for the trans-Pacific trade is announced. With the addition of the *West Nilus* to the Oriental trade route the Pacific Steamship Company will have six freighters in that service from Seattle. Full cargoes are again coming to the front in the General Steamship Corporation's service to the west coast of South America. The steamship *Derblay*, which recently discharged 3,500 tons of West Coast ore at the Tacoma smelter, was scheduled to load to capacity in Puget Sound and the Columbia River for her next voyage to South America. The shipment will include lumber, flour, wheat and other northwest products, and the steamship *Jeptha*, which brought 4,000 tons of ore for the same smelter, was booked full with northwest products for her next voyage to South America.

The steamship *Cordova*, of the Alaska Steamship Company, instituted on August 1st a new Seattle-Astoria-Hawaii passenger and freight service of that line with a full passenger list and heavy shipments of freight. It is understood as business develops the company will add other carriers to the new service which touches Honolulu and Hilo.

Improvement in trans-Pacific shipping conditions with full cargoes each way is again in evidence. The steamship *West Jester*, one of the Shipping Board carriers operated by Frank Waterhouse & Company, sailed August 1st from Seattle, with a capacity cargo of lumber, canned salmon, steel and general freight. The *West Ivan* arrived at Vancouver and Seattle, August 4, with a capacity cargo of hemp and general freight from the Orient. She was

booked to capacity for her next trip to the Orient, her shipments including lumber, hides, steel and general freight. The *West Jappa* was due to arrive at Seattle and Vancouver from the Orient late in August with a full cargo and she is already booked almost full for the return in September.

Pointing to the immediate improvement in the lumber trade between Seattle and California ports, W. R. Grace & Company are said to be returning their steam schooners to this trade in the very near future. It is stated that there is a lumber shortage of 50,000,000 feet about San Francisco and of 25,000,000 feet about Los Angeles which must be delivered in addition to the regular demand within the next few weeks.

Two Java-Pacific steamships, the *Thikembang* and the *Simaloer*, are expected to arrive at Seattle in September to load for Japan, China and the Dutch East Indies. The Java-Pacific Line is represented by the General Steamship Corporation.

With the placing of two steamers, the *Lurline* and the *Manukai*, of the Matson Navigation Company, on the triangular run which puts Puget Sound in direct connection with the Hawaiian Islands, Seattle now has direct combination freight and passenger service to Honolulu and the Islands. The two ships took out 15,000 tons of cargo weight and measurement.

The demand for lumber in Japan is expected soon to show a marked increase as a result of a big building boom in nearly all sections of the empire. It is learned that heretofore native lumber has been used exclusively in all but the finest houses, but with the reduced freight rates and lower operating costs of mills during the past two weeks, orders for 6,000,000 feet of 4 inch squares have been placed with the Northwest mills.

The motorship *Ozmo*, of the Northern Commercial Company, arrived at Seattle recently with a shipment of gold ore from the mines of the Alaska Treble Gold Mining Company in the Kuskokwim River district. On her departure from Seattle for Bethel, the ship had a full cargo of miscellaneous shipments and mining supplies.

Official announcement is made that the

French Line, or Compagnie Generale Transatlantique, has completed plans for the opening of service between the Pacific Coast and North and South America.

NEW STEAMER

Colonial Government Places Contract for Combination Boat

A contract for the construction of a new combination tug, tender and dispatch boat for the Colonial Government of the Bahama Islands has been placed with the Vineyard Shipbuilding Company, of Milford, Del. The boat is to be 120 feet over all length, 28 feet molded beam, 10 feet depth of hold, of wood construction and equipped with a 500 indicated horsepower fore and aft compound condensing engine with one Scotch boiler.

The vessel will be thoroughly equipped including mast, boom, and winch, an upper deck for day passengers, a few staterooms, and will be electrically lighted. The boat is expected to be completed in about six months, the work being under the supervision of the firm of Kindlund & Drake, consulting engineers and naval architects, 17 Battery Place, New York City.

WILL MAINTAIN SAILINGS

Receivers for U. S. Mail Lines to Operate on Schedule

Herbert Noble and Emmet J. McCormick, receivers for the United States Mail Steamship Company, have announced their intention of maintaining all sailings according to schedule. They even hope to improve the service and have declared that they desire to co-operate fully with the United States Shipping Board, and in return expect to receive co-operation from it. It is understood, however, that the Shipping Board still adheres to its original position and desires that the ships be returned.

It is reported that the first impression of the receivers is that the company can work out its own salvation. It is stated that while the company has real assets, they are not as large as they should be, but that Postmaster General Hays had advised the receivers that the Post Office Department would immediately pay the company a sum amounting to between \$250,000 and \$300,000 due for carrying the mails.

The *Pocahontas*, which is held at Naples under a libel for 1,000,000 liras, is to be released through arrangements made by insurance companies, but the *George Washington* is in danger of being libeled at Southampton for damages resulting from a collision which occurred during the war when that vessel was being operated by the Government.

Steamship Interests

The Coastwise Transportation Company, of Boston, Mass., has been absorbed by the American-Hawaiian Steamship Company. Under the merger the shareholders in the Coastwise Company were offered their choice between a cash consideration based on each share of their holdings, or shares in the American-Hawaiian Steamship Company, which now controls a fleet of twenty-eight vessels.

A new line of steamships to be known as the Latin-America Line, between North Pacific ports and the west coast of South America with regularly scheduled calls at Mexican Pacific ports, will be established with the first sailing on September 25, 1921, according to an announcement made by H. H. Hammer, president of the Universal Shipping & Trading Company, Seattle, Wash., northwest agents for the new service. The ships of the company comprise the steamships *Sinaloa*, *Baja California*, *Romulus*, *Remus* and *Regulus*. The service will be started with the coming of the *Baja California*. According to an agreement reached the Universal Company will be agents for the new service on the Columbia River and as far north as British Columbia, including Vancouver and Victoria as well as Puget Sound and Grays Harbor.

Announcement is made by the United American Lines, Inc., 39 Broadway, New York, of the establishment of a fortnightly service by the American Hawaiian Steamship Company from Philadelphia to Los Angeles Harbor, Seattle, Tacoma and Portland, commencing with the steamship *Floridian*, September 10; also an increase in their service from New York to United States Pacific Coast ports to weekly sailings commencing with the steamship *Ariзонian*, August 24; establishment of a fortnightly service by the American Hawaiian Steamship Company from United States Pacific Coast ports to the principal United Kingdom and continental ports, commencing with the steamship *Alaskan*, first half of October loading.

P. Kleppe & Company, Inc., 11 Moore street, New York, announce the inauguration of the Kleppe Line's new service from Gulf ports to Brazil and the River Plate. The first steamer will be the Norwegian steamship *Argentina*, expected to sail from New Orleans about September 10. Regular monthly sailings will be maintained. The steamship company will inaugurate on September 15 a regular freight service between New Orleans, Vera Cruz and Tacoma. It is expected that the steamers *Harriet* and *Hallgjerd* will be assigned to this route.

The Atlantic Gulf & Pacific Steamship Company has taken over the new oil burning steamer *Glenora* for the western trade. This additional sailing is reported as due to congestion of freight on the Pacific Coast.

The United States Mail Steamship Company has chartered the passenger liner *George Washington* to the Raymond & Whitcomb Travel Bureau for a tour to the Mediterranean, sailing from New York in February. Indications are that there will be a record number of tours to this section next winter as the International Mercantile Marine has announced the *Adriatic* and the Cunard Line has scheduled the

Cameronia and *Caronia* for the same voyage.

Commencing August 4, 1921, resumption of pre-war service from Puget Sound to Hawaii was inaugurated by the Matson Navigation Company, San Francisco, Cal., with a passenger and freight service, sailing from Seattle every five weeks. The steamship *Lurline* reopened the route which will be from Puget Sound to Hawaii, thence to San Francisco and Seattle. Alexander & Baldwin, Ltd., 500 Mehlhorn building, are the company's representatives.

The new 12,500 ton motorship *William Penn* has been assigned to the Barber Steamship Line of New York by the Shipping Board. The ship will make her maiden voyage to points in the Orient by way of the Panama Canal and Honolulu.

S. S. NEW YORK SOLD

Liner to Be Operated in Trade to Danzig by Polish Navigation Company

The sale is announced of the steamship *New York*, formerly operated by the American line in the transatlantic service, to the Franklin Steamship Corporation. The vessel, which is now being reconditioned, will be operated in the trade to Danzig by the Polish Navigation Company.

The *New York* has not been in active service since last fall, having been tied up at the piers of the International Mercantile Marine Company. The vessel has a gross register of 10,800 tons and is 517 feet long. Although built at the Clydebank yard of J. and G. Thomsen, the *New York* is under the American flag and is expected to sail for Danzig about September 14. The purchase price was said to be about \$600,000.

SHIPS AT \$5 A TON

Low Price Quoted from Abroad—Germany Active Buyer

H. D. Donald & Company, of 11 Broadway, New York, specializing in British tonnage, reports from their London agents the sale of a British steel freight steamer of 4,500 deadweight tons, built in 1898 in one of the best British yards, at a price given as £6,500 (or about \$5.00 per deadweight ton at the present rate of exchange). The ship was sold to British interests.

The same company is offering several similar steamers, all carrying 100-A-1 Lloyd's classification at the same price, delivery in the United Kingdom. Cable dispatches are said to indicate that Germany is buying actively in the British ship market.

FIVE VESSEL ASSIGNMENTS

Vessel assignments announced from Washington include the following:

Newburgh, assigned Munson Steamship Line, managing agent. Withdraw Division of Operations, managing caretaker.

Lake Filimore, assigned Mallory Steamship Company, managing agent. Withdraw managing agency, Clyde Steamship Company.

Vinton County, assigned Clyde Steamship Company, managing agent. Withdraw Divi-

STEAMER MAILS

New Method of Handling Foreign and Coastwise Sacks

A new service for handling mails arriving in New York harbor was inaugurated at midnight, July 31. Operation of the improved system, which expedites foreign and coastwise mails 24 hours or more, was witnessed on the inaugural day by Postmaster General Will H. Hays and a group of distinguished government and railroad officials.

The new service got off with a flying start. During the early hours of Monday morning, August 1, four mail-carrying steamships were met at Quarantine by special mail boats to which their mail was transferred at once and taken to the New York post office and to trains bound for other points. The result was that hours before the steamships docked at their respective piers the mail had either been delivered in New York City or had started on its way to interior destinations.

The first boat met at Quarantine by a special mail boat was the *San Lorenzo* from Porto Rico, carrying 451 sacks of mail. It arrived at 1.30 a. m. and within 30 minutes the transfer of mail had been completed. The *Cedric*, from Liverpool, was met at 3.45 a. m. It required about an hour to transfer the 1,347 sacks of mail which it had aboard. The *Zeeland*, from Antwerp, carrying 1,361 sacks of mail, was met at Quarantine at about 4.30 and less than an hour was consumed in transferring the mail to the harbor steamer, *The President*, which got the mail to the New York post office and outgoing trains in time for the early morning deliveries, while the *Zeeland* did not dock until noon. Under the old system the mail would not have been unloaded until after the steamship had docked. The *Ryndam*, from Rotterdam, was met at Quarantine about the same time as the *Cedric*. It carried only 20 sacks of mail.

The special mail boats which will hereafter meet all mail-carrying vessels are operated by the New York Central Railroad Company. Three boats are employed in maintaining a 24-hours-a-day service, two of the New York Central's steam lighters and *The President*, supplied by the War Department at a rental of a dollar a year.

The average mail cargo carried by ocean liners arriving in New York harbor is less than half the capacity of *The President*.

The three boats operated by the New York Central in the new mail service are run on 8-hour shifts so that one of them is on duty all of the time.

After witnessing a practical demonstration of the accelerated system for ocean mails Postmaster General Hays and members of his official party expressed the opinion that the new service will do all that is expected of it.

sion of Operations, managing caretaker.

Alcona, assigned Trosdal Plant and Lafonta, managing agent. Withdraw Division of Operations, managing caretaker.

Bartholomew, assigned New York and Cuba Mail Steamship Company, managing agent. Withdraw Division of Operations, managing caretaker.

Bareboat Charter Plan May Be New Policy Adopted by Shipping Board Within Next Thirty Days

**Chairman Lasker Says Operating Vice-Presidents Will Make
Complete Survey of Ship Operation Under Present
Form—All Balances "On Red Ink Side"**

The present system of ship allocation under the M. O.-4 contract for operators will be abandoned by the Shipping Board and some form of bareboat charter plan will be worked out for adoption within the next thirty days according to announcement from Washington. Under the present system, Chairman Lasker said in discussing the new plan, "The shipping Board is undergoing a constant loss. All of the balances are on the red ink side. We must get out of this situation some way and we have decided unanimously to try to work out some practical plan of bareboat charter in spite of the depression in shipping."

The Board's announcement reads as follows:

"The Board has directed the operating

vice-presidents to make a complete survey of the operation of the ships under the present form of managing operators' agreement, known as 'Mo-4,' under which the board has been paying operators a commission on the gross receipts for operations, the board assuming all expenses of operation.

"It is the hope of the commissioners of the board that the operating vice-presidents will be able to work out and present some plan of bareboat charter within the next thirty days for submission to the board, with a view to abrogating entirely the present method of operation and substituting therefor an agreement which will provide a net rental for the use of the ships, the charterer to pay all running expenses."

\$3,000,000 WIRELESS

Contract for Radio Corporation and General Electric Co.

Representatives of the Radio Corporation of America and of the Polish Ministry of Posts and Telegraphs on August 4 signed the final contract which will insure for Poland an international high power radio station of the most modern type.

This contract was executed at the office of the Polish Legal Bureau, 42 Broadway, New York, and was signed by Prince Kazimier Lubomirski, Envoy Extraordinary and Minister Plenipotentiary, Hipolit Gliwic, Commercial Counsellor of the Polish Legation and Engineer Eugene Stalinger, Division Chief at the Polish Ministry of Posts and Telegraphs.

The new radio plant will be situated near Warsaw, Poland, and it is estimated that the complete project will cost about \$3,000,000. The radio system to be used is that which has been standardized by the Radio Corporation of America for trans-oceanic radio communication. The station will be equipped with two 200 K.W. high frequency alternators built for the Radio Corporation by the General Electric Company, and the transmitting aerial wires will be approximately two miles in length supported by ten towers each 400 feet in height.

TO REPAIR CHARLOT

Standard Shipbuilding Corporation Is Low Bidder

The Shipping Board steamer *Charlot*, operated by the Kerr Steamship Lines, will probably be reconditioned by the first of October after having been seriously damaged as a result of a collision with an iceberg recently in the North Atlantic. The ship's bows were crushed in and she was brought into Halifax for temporary repairs. At the latter port a cement bulkhead was installed and the ship brought to New York.

Bids for the work of putting on a new bow were opened by the Shipping Board at 45 Broadway, New York, on Friday, August 19, the Standard Shipbuilding Corporation, Shooter's Island, N. Y., submitting the low bid of \$38,934. The specifications called for completion of the work by September 24. Other companies who bid for the job were:

James Shewan & Son, \$41,294; Robins Dry Dock & Repair Company, \$41,737; New York Harbor Dry Dock Company, \$44,240; Morse Dry Dock & Repair Company, \$45,000; Federal Shipbuilding Company, \$45,984; Staten Island Shipbuilding Company, \$51,360; Ira Bushey & Son, \$54,853; W. & A. Fletcher Company, \$61,800; Theodore Crane & Sons, \$63,600.

Majestic, World's Largest Ship, Nearing Completion

The world's largest ship, the 56,000-ton liner *Majestic*, formerly the *Bismarck* will probably be ready for service on the New York-Southampton run next spring according to reports received in New York by the International Mercantile Marine Company from representatives of the White Star Line at Hamburg.

In tonnage the *Majestic* is 10,000 tons larger than the *Olympic* and about 2,000 tons larger than the *Leviathan*. She will have accommodations for 1,000 first class passengers, 700 second class and 2,400 third class passengers with a crew of over 1,000 hands.

The *Majestic's* power installation is the largest ever fitted in a passenger vessel, consisting of four huge turbine engines for driving the hull ahead, and four reversing turbines. The weight of a single main turbine is 375 tons. It is expected that the driving engines will deliver a maximum of 62,000 to 64,000 indicated horsepower through four shafts to as many propellers each sixteen feet in diameter. At 170 revolutions the propellers will drive the ship under normal conditions at 23 knots.

Although not provided in her original design the liner is being fitted with an approved system for using oil fuel. She is expected to consume about 5,700 tons of the liquid in a single crossing and her storage tanks will have capacity for a round voyage supply. There are forty-eight boilers.

Round-the-World Trip Planned for Steamer St. Louis

The former American liner *St. Louis*, now owned by the Anderson Overseas Corporation, is expected to sail from New York early next January, carrying the products of about 300 of America's leading manufacturers into fifty foreign ports on an American sales promotion trip around the world, consuming about a year's time. The vessel will carry the slogan "I'll tell the world."

In outlining his plans, J. Herbert Anderson, president of the company; said:

"There are a few misgivings as to the present being the best time to send the *St. Louis* around the world. It should be remembered, however, that business conditions in some parts of South America are good and will have improved by the time 1922 breaks. Also that Japan, China, India, Australia, Norway and Sweden have been to a degree free from much of the financial worry attendant on the World War. The Balkan States should be fertile fields at present for the exchange of commodities. Australia always has been a strong buyer of foreign products, and could be made stronger by more aggressive salesmanship. All of these countries will be in the itinerary of the *St. Louis*.

"While manufacturers will have to supply their own sales literature making it applicable to the language of the countries the *St. Louis* will call at, and also their highest type of salesmen, the corporation will supply interpreters and credit men. The foreign field for American manufacturers may not be just ready today for exploitation, but foreign countries are straining at the leash for the word 'Go.'"

NEW ENGINEERING CORPORATION

A corporation of peculiar interest to ship operators and repair yards has been formed by combining the casting and manufacturing facilities of John Ferguson's Foxhill Foundry and the sales and engineering organization headed by Frederick D. Herbert, who is well known in the marine field. The title of the new combination will be "Ferguson-Herbert Corporation."

In an interview Mr. Herbert stated that the object of the new corporation would be to attempt to fill a long felt need for engineering supervision of material. Mr. Herbert feels that with the staff of engineers in his organization, who are constantly in touch with repair yards and steamship lines, and with the efficient manufacturing facilities of Mr. Ferguson's shops, the combination will prove to be of great service to port engineers and operators.

BUSINESS NOTES

The Bolinders Company of New York, builder of marine and stationary oil engines, has opened a New England office at 53 State street, Boston, Mass., in charge of Mr. K. H. Nilsson, treasurer. A stock of engines and parts and a staff of erecting and operating engineers will be available.

The American Balsa Company, Inc., announces the removal of its general offices from 50 East 42nd street, New York City, to 305 Vernon avenue, Long Island City, N. Y.

Announcement is made that Charles Cory & Son, Inc., New York, are now the exclusive marine distributors and installation engineers of Foamite Firefoam in the United States in cooperation with the Foamite Firefoam Company. Charles Cory & Son, Inc., have developed a number of different fire protection systems both for manual and automatic control for protection against fires in boiler rooms of oil burning vessels and for tank protection of fuel oil carrying ships. Under the direction of the marine distributors, the Foamite Firefoam Company, on July 13, gave a demonstration at the Foamite Laboratories at Camden, N. J., for the benefit of the Imperial Japanese Navy Commission, representatives of the United States Navy, shipyard officials, and municipal fire chiefs.

The Cincinnati office of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has been removed from the Dwyne building to the Dixie Terminal building. Mr. A. R. Maujer, formerly of the sales-engineering force of the Pittsburgh office, is now in charge of the Cincinnati office.

The United American Lines, Inc., 39 Broadway, New York, has opened an office in the Bourse building, Philadelphia, Pa.

Lykes Brothers, operators of the Lykes Lines, have established an office at Tampa, Fla., under the management of F. L. D. Carr, formerly of the Lykes' New Orleans office. The Tampa office will specialize in the handling of phosphate shipments.

TRADE PUBLICATIONS

Material Handling Equipment.—A catalogue describing cranes, dredges, barges, tow boats, mixer boats and other equipment for inland waterways, harbors and terminals has been sent out by the Dravo Contracting Company, Pittsburgh, Pa. Structural details and arrangement drawings are given for each unit with illustrations of equipment in operation.

Man Power Multiplied.—Locomotives and trackless tractor cranes having moderate lifting capacities and considerable speed of lift are described in a booklet issued by the Brown Hoisting Machinery Company, Cleveland, Ohio. It is stated that these cranes can go wherever required and do practically any kind of handling work. Applications of different types are shown, and additional and more complete

descriptions are given in catalogue K, sent out by this company.

Welding and Cutting Apparatus.—All manner of Rego oxy-acetylene welding and cutting apparatus produced by the Bastian-Blessing Company, Chicago, Ill., is illustrated and described in a recent catalogue released by this company. Together with specifications and prices of each instrument, tables of data giving torch pressures, gas consumption and the like are included in the book.

Lubrication—"Cloud and pour tests" in the matter of lubricating oils are discussed at considerable length in volume seven, number seven, of Lubrication, published by The Texas Company. The effects of improper carburetion and the flow of oil through bearings are additional subjects discussed in considerable detail. Diagrams and charts accompany the articles.

Boiler Production.—Two booklets have been sent out by the Bigelow Company, New Haven, Conn.; the first containing a general description of the Bigelow boiler, details of construction, useful tables, specifications and the like, while the second, entitled "Quality" outlines the methods used by the Bigelow Company to insure uniform high quality in all of its products.

G. T. D. Tools.—The Greenfield Tap & Die Corporation, Greenfield, Mass., is distributing a new and most comprehensive catalog describing the small tools and pipe tools which comprise the greater part of their product. From the frontispiece depicting the plants of this largest manufacturer of small tools in the world, to the seventy or more pages of tables and useful information at the back of the book, this catalog contains a great deal that is of interest to the user and designer of tools and machinery. Some of the tables are new and especially instructive. The tools described include screw plates, taps, dies, drills, reamers, milling cutters, bits, arbors, countersinks, hobs, tap and drill kits, mandrels, sleeves, sockets, stocks, tap wrenches, pipe vises and pipe wrenches.

New Skimmer Boom—Pawling & Harnischfeger Company, of Milwaukee, has just issued Pamphlet TX which describes and illustrates the new Skimmer Boom designated for attachment to the standard P & H 205 or 206 Excavator-Crane. The point is made that by replacing the standard boom of either of these cranes, an efficient road grading machine is provided. In fact, this is similar to the shovel attachment brought out earlier this year and which is designed for use with either of the two types of P & H cranes mentioned.

MARINE SOCIETIES

AMERICA**AMERICAN SOCIETY OF NAVAL ENGINEERS**

Navy Department, Washington, D. C.
President—Capt. A. J. Hepburn, U. S. N.
Secretary-Treasurer—Commander J. S. Evans, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.
Annual meeting and election, first Tuesday in October, other meetings at call of the President.

SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS

29 West 39th Street, New York.
President—Rear Admiral W. L. Capps, C. C., U. S. N.
Secretary and Treasurer—Daniel H. Cox.

NATIONAL ASSOCIATION OF ENGINE AND BOAT MANUFACTURERS

29 West 39th Street, New York City.

UNITED STATES NAVAL INSTITUTE

Naval Academy, Annapolis, Md.
President—Rear Admiral Bradley A. Fiske, U. S. N.
Secretary and Treasurer—Commander H. K. Hewitt, U. S. N.

NATIONAL ASSOCIATION OF MASTERS, MATES AND PILOTS

National President—John H. Pruett, 423 Fortyninth St., Brooklyn, N. Y.
National Treasurer—A. R. Devlin, 187 Randolph Ave., Jersey City, N. J.
National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

LIST OF OFFICERS, AMERICAN SOCIETY OF MARINE DRAFTSMEN

President—C. E. Deiser, 6124 Nassau Road, Philadelphia, Pa.
Vice-President—E. H. Monroe, 902 Virginia Ave., Washington, D. C.
Secretary—B. G. Barnes, 47 Saville Ave., Quincy, Mass.
Treasurer—J. B. Sadler, P. O. Box 987, Norfolk, Va.
Executive Committeemen—G. W. Nusbaum, Washington, D. C.; A. H. Haag, Baltimore, Md.; John Thomson, Bethlehem, Pa.

NATIONAL MARINE ENGINEERS' BENEFICIAL ASSOCIATION

Headquarters 311-315 Machinists Building, Washington, D. C.
President—Wm. S. Brown.
Secretary-Treasurer—George A. Grubb.

ATLANTIC COAST SHIPBUILDERS' ASSOCIATION

1701 Walnut Street, Philadelphia, Pa.
Secretary—C. S. King.

AMERICAN STEAMSHIP OWNERS' ASSOCIATION

17 Battery Place, New York
Vice-President and General Manager—Winthrop L. Marvin.

AMERICAN STEAMSHIP OPERATORS' ASSOCIATION

17 Battery Place, New York

CANADA**GRAND COUNCIL, N. A. OF M. E. OF CANADA**

Grand President—E. Read, Rooms 10-12, Jones Building, Vancouver, B. C.
Grand Vice-President—Jeffrey Roe, Levia, P. O. Box 886, St. John, N. B.
Grand Secretary-Treasurer—Neil J. Morrison, Box 886, St. John, N. B.
Grand Conductor—E. A. House, Box 333, Midland, Ont.
Grand Door Keeper—Lemuel Winchester, 306 Fitzroy Street, Charlottetown, P. E. I.

GREAT BRITAIN**INSTITUTION OF NAVAL ARCHITECTS**

5 Adelphi Terrace, London, W. C.

INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND

39 Elmbank Crescent, Glasgow.

NORTHEAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS

Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

INSTITUTE OF MARINE ENGINEERS, INCORPORATED

The Minories, Tower Hill, London.

ITALY

COLLEGIO DEGLI INGEGNERI NAVALI E MECCANICI IN ITALIA.
Via Carlo Alberto 18, Genova.

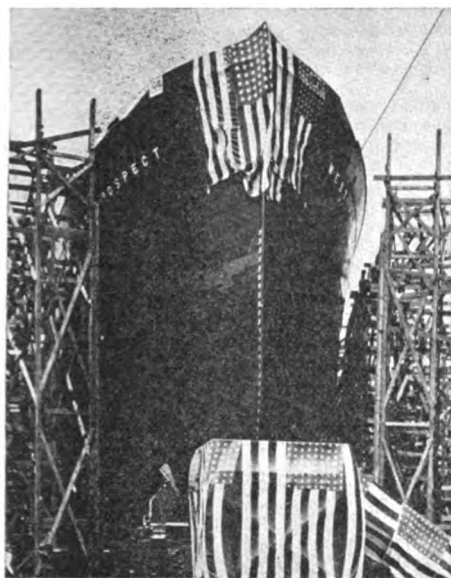
Shipbuilding and Shipyard Development

What the Shipyards Are Doing—Dry Dock Notes
—Port Expansion Plans—Engineering Projects

Thousands of Tons in New Ships Are Ready for Improvement in Marine Transportation Business

Recent Launchings in United States Show Latest Developments in
Cargo Carriers with Modern Equipment—Ore, Oil and
General Freight Ships Added to Various Fleets

The *West Prospect*, 11,000-ton freighter, the thirty-fourth large steel hull built by the Los Angeles Shipbuilding & Dry Dock Company, was launched from the ways of that company in Los Angeles Harbor, Cal., on July 30, 1921.



Shipping Board Freighter *West Prospect*
Ready for the First Dip

Since December 15, 1917, the company has converted seventy acres of tide lands into a shipbuilding and ship repair plant recognized as among the best designed and equipped on the east or west coasts and from this plant has launched thirty 8,800-ton steel freighters and counting the launching of July 30, four 11,000-ton flush deck freighters.

Of this total of thirty-four vessels the plant has supplied twenty-six with the main marine engine of its own design and building which develops 3,500 horsepower at 85 revolutions or a little over 4,000 horsepower at 90 revolutions. Besides the main engines, practically all the auxiliary machinery, equipment and furnishings are also the products of the various shops of the plant.

The first of the 11,000-ton flush deck freighters was the *West Lewark*, launched February 24, equipped, completed and de-

livered July 7 and then chartered by Williams, Dimond & Company, Pacific Coast shippers for Pacific-European trade. The *West Lewark* on her maiden voyage to Columbia River and Puget Sound ports to take on cargo for Europe is said to have attracted the closest attention from shipping men generally who claim that she presented in the highest degree the combination of economy in cargo handling and storage with speed and that as such this class of freighter marked the biggest advance in cargo carrying ships made by any shipyard in the United States in the past four years.

Mrs. Milo A. Baker, who sponsored the *West Prospect*, is the wife of the vice-president of the Baker Iron Works and sister-in-law of Mr. Fred L. Baker, president of the Baker Iron Works, and also president of the Los Angeles Shipbuilding & Dry Dock Company.

Oil and Ore Vessel Launched at Sparrow's Point, Md.

The first of the combination ore and oil vessels building at the Sparrow's Point Plant, Sparrow's Point, Md., of the Bethlehem Shipbuilding Corporation, Ltd., was launched on July 12, 1921. Delivery is scheduled for about the middle of September. This vessel, the *G. Harrison Smith*, is being built for the International Petroleum Company and is one of four ships of this type under construction at Sparrow's Point, the other three being for the Ore Steamship Corporation.

The *G. Harrison Smith* is distinctive in that it is the largest vessel ever constructed at this plant, having a deadweight capacity of 20,000 tons and a length overall of 571 feet, 6 inches. It is designed for carrying a full cargo of either ore or oil in separate compartments. The ore cargo will be carried in a narrow elevated hold 30 feet wide and 360 feet long. It is divided by watertight bulkheads into three compartments, each of which is served by three large hatches extending the full width of the ore hold.

The oil space, alongside and below the ore space, is divided by a longitudinal bulkhead extending from the keel to the ore hold. The foremost and aftermost compartments are for fuel oil and the tanks



Launching 20,000-Ton Combination Oil
and Ore Vessel

between these are for cargo oil. There are no summer tanks.

The wing spaces, acting as expansion trunks, on account of their depth afford the greatest possible flexibility for carrying liquid cargoes of varying density and adjusting the trim under all conditions of load.

The *Levant Arrow* an 18,277-Ton Oil Tanker

The *Levant Arrow*, built for the Standard Transportation Co., was launched in the South Yard of the New York Shipbuilding Corporation, Camden, N. J., Monday evening, July 25, 1921 at 7 o'clock. The vessel was christened by Mrs. Beryl H. P. Thomas wife of Mr. L. I. Thomas, a director of the Standard Oil Company of New York.

The overall dimensions of the ship are 485' in length, beam 62'6" and depth 39'6". The vessel will have ten double main cargo tanks with a combined capacity of 3,500,000 United States gallons. It has a displacement of 18,277 tons and carries a crew of 62 men.

10,000-Ton Tanker Launched

The 10,000 deadweight ton oil tanker *Robert G. Hopkins*, built for the Tidewater Oil Company of New York, was launched on Saturday, August 6, 1921, at the Chester yard of the Merchant Shipbuilding Corporation, Chester, Pa. The ship measures 440 feet over all length, with a 58 foot beam and a molded depth of 33 feet. She is capable of carrying 70,000 barrels of cargo oil in her 18 main oil tanks, besides 9,550 barrels of fuel oil.

Marine Construction News of the Month

Ship Contracts—New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPS AND SHIPBUILDING

Repair Contracts, Hoboken, N. J.—A contract for general machinery and dock equipment overhaul in addition to dry docking, reconditioning holds and bunker spaces on the United American Line steamship Franklin has been awarded to the W. & A. Fletcher Company, on a bid of \$15,000. Other contracts awarded to the Fletcher Company during the past week included general overhauling and voyage repairs to the Standard Oil ship El Capitán; dry docking and bottom work on the Holland American ship Beenbijk; and a survey of the American Hawaiian ship Dakotan.

Car Float Contract, Shooters Island, N. Y.—The Standard Shipbuilding Corporation has been awarded the contract for cutting down two car floats of George B. Stearin, Inc., 90 West Street, New York, making them into four scows. The car floats are about 300 feet long and will be made into four scows each 150 feet long.

Salvage Steamer, Mobile, Ala.—It is announced that a salvage crew from the Alabama Dry Dock & Shipbuilding Company has left that plant for the Mexican Coast to raise the sunken steamship Westernian. The ship is believed to be lying about 20 miles off the Campeche Coast and it is hoped that the vessel will be successfully raised and brought back to Mobile for reconditioning. Mr. J. K. Moffatt is in charge of the salvage crew.

Vessels under Repair, Mobile, Ala.—Vessels under repair at the plant of the Alabama Dry Dock & Shipbuilding Company, during the past week include the steamships City of Brunswick, Santa Alicia, U. S. L. H. S. launch No. 82, and schooners Philip M. Brooks and Maplefield.

Reconditioning Steamer, Brooklyn, N. Y.—The contract for reconditioning the passenger steamship New York which was recently sold to the Franklin Steamship Corporation of New York City and will be operated in the trade to Danzig by the Polish Navigation Company, has been awarded to the Morse Dry Dock & Repair Company. The ship was formerly in the transatlantic service of the American Line and is to be completely overhauled. The Morse Company has also been awarded the contract for general overhaul of machinery and plate work on the American Hawaiian steamship Dakotan. The ship is of 6,660 gross tons, 407 feet long and it was reported that the repairs would amount to about \$17,000. At the same yard for general overhaul and plate work are the tank ship John D. Rockefeller of the Standard Oil Company and the W. L. Steed of the Pan-American Petroleum Company.

Keel Laid for Tanker, Wilmington, Del.—The Harlan plant of the Bethlehem Shipbuilding Corporation recently laid the keel of the 2,500 ton tanker to be built for the Atlantic Refining Company.

Contracts Awarded, Hoboken, N. J.—The steamship American Star has been awarded to the W. & A. Fletcher Company for general repairs, at a price close to \$5,000.

Ferry, DeFuniak Springs, Fla.—The Walton County Commissioners plan to construct a ferry at Santa Rosa, north landing at Old Bayview on Black Creek and southern landing at Point Washington. A \$50,000 bond issue is contemplated.

Shaft Repairs, Hoboken, N. J.—The W. & A. Fletcher Company has been awarded the contracts for renewing a shaft in the Hudson river passenger steamer Washington Irving and a similar job on the D. L. & W. ferryboat Paunpeck. It is expected the total cost will be close to \$25,000.

To Complete Vessels, Vancouver, B. C.—It is announced that the Dominion government has decided to take over the work of completing three barkentines, the construction of which was started at the Chollers Shipyards. All British Columbia shipyards are said to have figured for the work.

Steamer Repairs, Baltimore, Md.—The contract for repairs to the Atlantic Gulf & Pacific Line steamer Liberator was awarded to the Union Shipbuilding Company, Baltimore, Md., on a bid of \$1,200. The Shipping Board has awarded the contract for repairs to the steamer Coelada to the H. E. Crook Company, also of Baltimore, at a price of \$1,095.

Prospective Reconditioning, New York.—Although it was reported that Sloan Danenhauer, 11 Broadway, New York City, was contemplating reconditioning the ship Isle De Luzon, it was stated at the offices that no decision had been reached as to which of the Danenhauer ships will be converted. First reports were to the effect that the Luzon would be made into a wrecker.

Buoy Construction, Charleston, W. Va.—The Charles Ward Engineering Works, on a bid of \$2,958 and 75 days, was low bidder for furnishing nine second and third class tall type man buoys for the Department of Commerce, lighthouse service, Tompkinsville, N. Y. There were 20 other bidders, the prices ranging up to \$15,900 and 180 days.

Barges, Pittsburgh, Pa.—It is reported that the Dravo Contracting Company has recently secured a contract for the construction of two 100,000-gallon molasses barges which will be fabricated and assembled complete at the Neville Island plant of the company and will be knocked down for shipment to Havana for Cuban service.

Repairs to Schooner, Chelsea, Mass.—Needing a new keel and much new planking, the auxiliary fishing vessel, Flora L. Oliver, which ran aground recently while inbound from the grounds has been towed to the shipyard of Richard T. Green & Company, where it will undergo temporary repairs prior to being permanently refitted at Gloucester.

Supply Contract Award.—The American Chain Company, 1054 Grand Central Terminal, New York City, is announced as the successful bidder for a large number of 15 fathom pieces of open link buoy chain and 40 bell buoy bridle chains with rings attached, bids for which were opened at the office of the Superintendent of Lighthouses, 3d District, Tompkinsville, New York, on July 29. The total price submitted was \$27,877.64. The contract is to be completed within 60 calendar days.

To Build Barges, Roanoke, Va.—Announcement is made that the Virginia Bridge & Iron Company, with branch plant at North Memphis, Tenn., has taken orders for the construction of four barges for oil service in the vicinity of New Orleans. The boats are to be 125 feet in length. The company, with a branch at North Memphis, Tenn., has acquired about ten acres on the Wolfe river, formerly occupied by the Anchor Saw Mills, for the production of all-steel barges.

Repair Contract Awards, Baltimore, Md.—The Baltimore Dry Docks & Shipbuilding Company was awarded the contract for docking and repairing the steamer Auburn at its bid of \$4,146. The Globe Shipbuilding Company bid \$4,206 on this contract and the Bethlehem Shipbuilding Corporation, \$5,940. The steamer Clarence will be repaired by the Union Shipbuilding Company, the contract having been awarded by the Shipping Board to this company on its bid of \$804.

Fire Prevention Apparatus to Be Installed.—To minimize the danger of fires on board ships of its fleet, the Standard Oil Company of New Jersey is installing Foamite Firefoam apparatus, manufactured by the Foamite Firefoam Company. The first of its Pacific Coast fleet to be so equipped is the 10,000-ton tanker Bradford. This system is recognized by the United States Steamboat Inspection Service, and it is expected that all oil carriers of the Pacific Coast will be fitted with it.

Repairs to Steamer, San Francisco, Cal.—Repairs aggregating \$40,000 will be made on the Matson Navigation Company's liner Hawkeye State. The work necessitated the retubing of seven of the eight boilers of the vessel, and sealed bids for the work were submitted on July 26. The Moore Shipyards

and the Bethlehem Shipbuilding Corporation, San Francisco, Cal., are said to be the only two plants equipped to do the work.

Repair Bids.—The Staten Island Shipbuilding Company, New York, was low bidder for the job of repairing the United American Line ship Transportation, bids for which were opened at noon August 12, at 39 Broadway, New York City. The bid was \$6,170 and 12 days, other figures being Standard Shipbuilding Corporation, \$7,348; Morse Dry Dock & Repair Company, \$6,995; Robins Dry Dock & Repair Company, \$7,080; New York Harbor Dry Dock Company, \$7,970; W. & A. Fletcher Company, \$8,390; Ramberg Dry Dock Company, \$9,953; National Dry Dock Company, \$10,892; Crane Dry Dock Company, \$11,600.

Repair Contract, Baltimore, Md.—One of the largest repair specifications asking for bids by the Shipping Board at Baltimore was opened recently, but being beyond the amount permitted without being referred to the office in New York, the successful bidder was not named. The bids were for repairs to the steamer Cusnoc and included her turbines. Bids submitted are as follows:

H. E. Crook Company	\$11,654
Baltimore Dry Docks & Shipbuilding Company	12,459
Spedden Shipbuilding Company	13,778
Globe Shipbuilding Company	14,027
Obrecht Company	14,185
Union Shipbuilding Company	14,638
Bethlehem Shipbuilding Corporation	14,700
Westinghouse Electric Company	15,424
Curtis Bay Copper & Iron Works	15,698

Barges, New York.—The New York Central Railroad is planning to build several grain barges and car-floats for service in New York harbor. Authorization of this construction is expected in the near future. Further details can be obtained from the marine department of the railroad, 6 Beaver street, New York City.

Cable Steamer.—The awarding of the contract for the Western Union cable steamer, plans and specifications for which were sent out by J. W. Millard, naval architect, 17 State street, New York City, is being held up awaiting bids from shipyards in Great Britain and France. This vessel will be equipped with Diesel electric propelling machinery, installed in four units. It is understood that the vessel will be registered and operated under the British flag, regardless of whether it is built in an American or foreign shipyard.

Plan New Vessels.—It was stated that preliminary plans are being considered for new passenger vessels for the Great Lakes. Although authentic details were not available, it is understood that, with the adoption of certain changes in the Seamen's Act, construction of one and possibly more passenger ships for the Lakes will be undertaken. Naval architects say that no new vessels have been built in recent years for the Lakes passenger traffic.

Ferryboats, San Francisco, Cal.—The Six-Minute Ferry Company, 948 Market street, is planning to build at least three, and possibly four, all-steel ferryboats for operation between San Francisco and Oakland. This company already has in operation two boats, the Vallejo and San Jose. The Golden Gate Ferry, San Francisco, Cal., is also planning the construction of two additional ferryboats for its service.

Passenger Vessel.—In the Puget Sound district plans are being made for the construction of a 250-foot passenger ship.

Todd Plant Awarded Wenatchee Overhaul.—The contract for making alterations and improvements on the Shipping Board liner Wenatchee has been awarded to the Todd Shipyard Corporation, Seattle, Wash., plant, on a bid of \$149,600. Extensive machinery repairs are included in the overhauling. Other bidders were the Bethlehem Shipbuilding Company, San Francisco, Cal., \$162,315; Los Angeles Shipbuilding Company, \$155,485, and the Moore Shipbuilding Company, San Francisco, Cal., \$177,520.

CONSTRUCTION FOR NAVY

Vessels under construction for the United States Navy and the degree of completion as reported July 31, 1921, by the Bureau of Construction and Repair, Washington, D. C., are as follows:

Type Number and Name	Contractor	Per Cent. of Completion Aug. 1	Total
BATTLESHIPS (BB)			
44 California	Mare Island Navy Yard	99.	
45 Colorado	New York S. B. Corp.	77.1	
46 Maryland	Newport News S. B. & D. D. Co.	68.3	
47 Washington	New York S. B. Corp.	59.3	
48 West Virginia	Newport News S. B. & D. D. Co.	32.9	
49 South Dakota	New York Navy Yard	31.2	
50 Indiana	Mare Island Navy Yard	26.6	
51 Montana	New York Navy Yard	36.1	
52 North Carolina	Newport News S. B. & D. D. Co.	28.3	
53 Iowa	Beth. S. B. Corp. (Fore River)	10.4	
54 Massachusetts	Beth. S. B. Corp. (Fore River)	10.4	

BATTLE CRUISERS (CC)			
1 Lexington	Beth. S. B. Corp. (Fore River)	23.1	
2 Constellation	Newport News S. B. & D. D. Co.	12.5	
3 Saratoga	New York S. B. Corp.	25.6	
4 Ranger	Newport News S. B. & D. D. Co.	10.4	
5 Constitution	Philadelphia Navy Yard	10.2	
6 United States	Philadelphia Navy Yard	10.2	

SCOUT CRUISERS (LIGHT CRUISERS CL)			
4 Omaha	Todd D. D. & Const. Corp.	93.9	
5 Milwaukee	Todd D. D. & Const. Corp.	91.3	
6 Cincinnati	Todd D. D. & Const. Corp.	86.2	
7 Raleigh	Beth. S. B. Corp. (Fore River)	63.2	
8 Detroit	Beth. S. B. Corp. (Fore River)	63.2	
9 Richmond	Wm. Cramp & Sons Co.	69	
10 Concord	Wm. Cramp & Sons Co.	65	
11 Trenton	Wm. Cramp & Sons Co.	50	
12 Marblehead	Wm. Cramp & Sons Co.	46	
13 Memphis	Wm. Cramp & Sons Co.	40	

*Battle cruiser No. 4—Keel laid 6-23-21.

AUXILIARIES			
Fuel Ship No. 18, Pecco (Oiler A06)	Boston Navy Yard	99.	
Repair Ship No. 1, Medusa (AB1)	Puget Sound Navy Yard	66.	
Dest. Tender No. 3, Dobbin (AD3)	Philadelphia Navy Yard	66.3	
Dest. Tender No. 4, Whitney (AD4)	Boston Navy Yard	30.6	
Sub. Tender No. 3, Holland (AS3)	Puget Sound Navy Yard	21.5	
Aircraft Tender, Wright (AZ1)	Tietjen & Lang	87.	

PATROL VESSELS			
Gunboat No. 22, Tulsa (PG22)	Charleston Navy Yard	70.3	
Authorized but not under construction or contract.			
(1) Transport No. 2.			

DESTROYERS			
338 Wasmuth	Mare Island Navy Yard	98.6	
339 Trever	Mare Island Navy Yard	95.3	
340 Perry	Mare Island Navy Yard	86.7	
341 Decatur	Mare Island Navy Yard	61.3	
Destroyers authorized but not under construction or contract.			
(12) Nos. 348 to 359 inclusive.			

SUBMARINES			
115 S-10	Portsmouth, N. H., Navy Yard	93.1	
116 S-11	Portsmouth, N. H., Navy Yard	89.9	
117 S-12	Portsmouth, N. H., Navy Yard	87.1	
118 S-13	Portsmouth, N. H., Navy Yard	81.6	
119 S-14	Electric Boat Co. (Quincy)	97.	
120 S-15	Electric Boat Co. (Quincy)	96.5	
121 S-16	Electric Boat Co. (Quincy)	98.5	
122 S-17	Electric Boat Co. (Quincy)	94.9	
123 S-18	Electric Boat Co. (Quincy)	95.8	
124 S-19	Electric Boat Co. (Quincy)	94.	
125 S-20	Electric Boat Co. (Quincy)	93.	
126 S-21	Electric Boat Co. (Quincy)	93.5	
127 S-22	Electric Boat Co. (Quincy)	92.4	
128 S-23	Electric Boat Co. (Quincy)	91.	
129 S-24	Electric Boat Co. (Quincy)	91.6	
130 S-25	Electric Boat Co. (Quincy)	90.5	
131 S-26	Electric Boat Co. (Quincy)	97.5	
132 S-27	Electric Boat Co. (Quincy)	95.9	
133 S-28	Electric Boat Co. (Quincy)	99.2	
134 S-29	Electric Boat Co. (Quincy)	95.1	
135 S-30	Electric Boat Co. (San Fran.)	91.5	
136 S-31	Electric Boat Co. (San Fran.)	88.4	
137 S-32	Electric Boat Co. (San Fran.)	86.	
138 S-33	Electric Boat Co. (San Fran.)	78.6	
139 S-34	Electric Boat Co. (San Fran.)	74.1	
140 S-35	Electric Boat Co. (San Fran.)	76.7	
141 S-36	Electric Boat Co. (San Fran.)	70.5	
142 S-37	Electric Boat Co. (San Fran.)	70.8	
143 S-38	Electric Boat Co. (San Fran.)	69.	
144 S-39	Electric Boat Co. (San Fran.)	69.7	
145 S-40	Electric Boat Co. (San Fran.)	68.2	
146 S-41	Electric Boat Co. (San Fran.)	67.6	
147 S-42	Electric Boat Co. (Quincy)	95.6	
148 S-43	Electric Boat Co. (Quincy)	90.1	
149 S-44	Electric Boat Co. (Quincy)	87.8	
150 S-45	Electric Boat Co. (Quincy)	81.6	

FLEET SUBMARINES			
60 T-2 (SF 2)	Electric Boat Co. (Quincy)	99.3	
163 V-1 (SF 4)	Portsmouth, N. H., Navy Yard	3.3	
164 V-2 (SF 5)	Portsmouth, N. H., Navy Yard	3.3	
165 V-3 (SF 6)	Portsmouth, N. H., Navy Yard	3.3	

Note: Submarines authorized but not under construction or contract.

Fleet submarines (6) Nos. 166 to 171.

Naval submarines (1) No. 108.

New Liner for Philadelphia-Liverpool Service.—Advices received at the offices of the White Star Line in Philadelphia indicate that the new 16,600-ton liner Pittsburgh should be ready to take her place on the Philadelphia-Liverpool service early in 1922. The Pittsburgh will reinforce the Haverford, at present the largest liner in regular service to Philadelphia. The Pittsburgh is a finely modeled vessel, 600 feet long with a breadth of 68 feet. She has 14 watertight compartments and five completely plated decks, as well as a promenade deck and boat deck. Her triple screws are driven by a combination of reciprocating engines and a low pressure turbine. The vessel will use oil for fuel.

Madawaska at Standard Yards.—The United States Army transport Madawaska has been transferred from Pier 1, Army Base, Brooklyn, N. Y., to the yards of the Standard Shipbuilding Corporation, Shooters Island, N. Y., pending the final award of the contract to recondition the ship to that company. Bids for the repairs and alterations were opened in Brooklyn last April, the Standard company being the low bidder. The work, it was stated, will include the installation of three double-ended and one single-ended Scotch boilers, new tank tops and considerable refrigeration space.

Panhandle State to Be Reconditioned.—Bids for reconditioning the Shipping Board steamer Panhandle State, the specifications calling, among other things, for the installation of accommodations for 596 third class passengers and 84 first class passengers, were opened at 45 Broadway, New York City, on Wednesday, August 10, with the following results:

Sun Shipbuilding Company	\$139,544
Bethlehem Shipbuilding Corporation	153,500
Robins Dry Dock & Repair Company	159,000
New York Harbor Dry Dock Company	159,668
W. & A. Fletcher Company	169,000
Morse Dry Dock & Repair Company	179,000
Standard Shipbuilding Corporation	196,000
Merchant Shipbuilding Corporation	219,000
Baltimore Dry Docks & Shipbuilding Company	236,336

Drill Boat Contract Awarded, Pittsburgh, Pa.—The Dravo Contracting Company has been awarded the contract for the construction of a drill boat for the government, bids for which were opened at the United States Engineer Office, Room 710, Army Building, New York City, on June 30. The award was made on the company's figure of \$431,500, the time for the completion being eight months. Sixteen other companies from various sections of the country submitted tenders for the work, the prices ranging up to \$620,000 and nine months' time, as exclusively reported by Marine Engineering on July 2. The boat is to be built of steel, 140 feet in length, the equipment including two water-tube boilers fitted with oil burning system, ten-rock drill engines and four cargo winches.

Newburgh Shipyards Low Buoy Bidder.—The Newburgh Shipyards, Inc., with a price of \$10,257, was low bidder for the supplying of 15 bell buoys, fixed counterweight with bell, for the Department of Commerce, lighthouse service, Tompkinsville, N. Y.

Bids for New Ships Received, New York.—Bids for the two new Red "D" Line passenger vessels, which have been submitted by a selected list of American shipbuilders who have had experience in this class of construction, are now being considered and it is expected that the contracts will be awarded within two or three weeks. It is understood that the lowest bidder for this work is the Merchant Shipbuilding Corporation, Chester, Pa.

GOVERNMENT WORK

Dredging, Etc., San Diego, Cal.—Specification 4485, the Bureau of Yards and Docks, Navy Department, Washington, D. C., will receive bids until September 7 for dredging and filling in and repairing the Naval Base.

Quay Wall Extension, San Diego, Cal.—Specification 4484, the Bureau of Yards and Docks, Navy Department, Washington, D. C., will receive bids until September 7 for extending the quay wall at the Naval Base.

Machine Shop, Pearl Harbor, H. T.—Specification 4464, the Bureau of Yards and Docks, Navy Department, Washington, D. C., will receive bids until September 21 for erecting the steel work of the machine shop at the Naval Station, which is to be one-story 181 by 520 feet.

Boiler Plant Equipment, San Diego, Cal.—The Bureau of Yards and Docks, Navy Department,

Washington, D. C., will soon receive bids for installing four 150 horsepower return tubular boilers and two vacuum pumps furnished by the Government and furnishing and installing a feed water heater storage tank, two boiler feed pumps, fuel oil pump and heater, two steel oil storage tanks, structural steel supports and concrete foundations for all equipment, concrete floor for boiler plant, brick settings, for four 150 horsepower return tubular boilers, concrete trenches, ball accessories and complete piping systems for all equipment in the boiler plant at the Naval Base Hospital Reservation.

Fog Alarm System, Vancouver, B. C.—The Federal Government of Canada, Department of Marine, is calling for tenders for the construction of a fog alarm system to be erected at Entrance Island, Quatsino Sound. It is planned to have this station completed before the winter fog arrives.

Mechanical Equipment, Boston, Mass.—Specification 4435, the Bureau of Yards and Docks, Navy Department, Washington, D. C., plans to install mechanical equipment and piping, and also to alter the boiler plant.

PORT IMPROVEMENTS

Wharf, Houston, Tex.—The city is reported as contemplating a \$2,000,000 bond issue, of which \$1,250,000 is for dock and wharf facilities.

Dredging, Jacksonville, Fla.—The city rejected bids for dredging 70,000 cubic yards in the St. Johns River, to cost about \$45,000. F. M. Edwards, 1004 Main street, city engineer.

Breakwater and Seawall, Rockport, Tex.—The city has approved plans for the breakwater and seawall to be constructed. Fred M. Percival is county engineer.

Pier Equipment, Philadelphia, Pa.—Various mechanical apparatus, including hoisting and conveying machinery, will be installed on the two new piers to be constructed by the Department of Wharves, Docks and Ferries of the city of Philadelphia, Pa., of which Director Sproule is in charge.

Galveston, Tex., Harbor Improvement—Patrol Boat.—Congressman Briggs, of Galveston, Tex., supported by Congressman Garrett, of Houston, introduced into Congress a bill providing for the construction of further aids to navigation in Galveston harbor and channel, Houston Ship Channel and the Texas City and Port Bolivar channels. The bill also provides for the purchase of a patrol boat to care for such aids as would be provided under the bill. The bill was referred to the Interstate and foreign commerce committees, where it is said to be certain of adoption.

Bond Issue for Port Projects, Wilmington, Del.—The City Council has approved a bond issue of \$600,000 to be used by the Board of Harbor Commissioners in connection with the marine terminal project. The total appropriation available amounts to \$2,500,000 and will be utilized as the work proceeds. The project will include a number of piers and docks, equipped with freight-handling and conveying machinery, as well as hoisting equipment, etc. It is reported that contracts for certain features of the work will soon be let.

Piers, Philadelphia, Pa.—Plans and specifications have been drafted by Director Sproule, of the Department of Wharves, Docks and Ferries, for new piers on the Delaware River front, north of Market street, which when finished will equal if not surpass any municipal pier in the country. The property taken by the city under condemnation proceedings belonged to the Girard and Clyde estates and the United Fruit Company. A board of review has awarded \$1,613,499.25 in damages and interest. The plans of the department provide for the construction of two large piers which will bring the city property directly up to Market street ferry, in what is regarded as the most eligible water front in the city.

Dredging, Milwaukee, Wis.—The city let a contract for (1) 431,000 cubic yards of dredging along the west side of Jones Island at \$24.75 per cubic yard, (2) removal of wrecks at a price of \$10,000 to the Cleveland Engineering & Construction Company, 778 The Arcade, Cleveland, Ohio.

Dredging, Canton, Ohio.—The city let a contract for dredging, widening, and straightening East Creek from Tuscarawas street east to 9th street, N. E., also building a concrete retaining wall to F. R. Jones Construction Company, 139 North Clark street, Chicago, Ill. The project will involve the expenditure of \$204,526.

through the port is being made for presentation to the commission of public docks.

\$358,000 Authorized to Rebuild Ferry Terminal, New York.—The Board of Estimate of New York City has authorized the issuance of \$358,000 in corporate stock for the reconstruction of the terminal at the foot of Greenpoint avenue, Brooklyn, N. Y., to operate the ferry between Greenpoint and East 23d street, Manhattan. This ferry was abandoned by a private operating company some time ago.

Three Piers Advocated, Conn.—Advocating the construction of three new piers on the Connecticut coast, to equal if not excel the million dollar structure at New London, Governor Everett J. Lake, addressing the third annual outing of the Bridgeport Chamber of Commerce at Pleasure Beach, Conn., July 20, expressed a strong desire to see the state equipped to properly care for coastwise and ocean-going vessels.

The governor stated that he has appointed a commission to look over the proposition for the building of such a dock at New Haven and suggested Bridgeport and Norwalk as logical places for similar piers for the added benefit of the shipping facilities of the state.

Ferry Back to be Repaired, Ellis Island.—Sealed proposals in triplicate will be received in the office of the Commissioner of Immigration, Ellis Island, N. Y., until 1:30 p. m. August 25, for repairing the ferry rack. Further information may be obtained upon application to Frederick A. Wallis, Commissioner.

Piers, Philadelphia, Pa.—The Department of Wharves, Docks and Ferries, plans to remove the old wooden piers north of Market Street on the Delaware River and replace the same with three large modern double deck structures, one pier 70 feet wide and two piers, 160 feet wide, all docks and waterways 170 feet wide and 550 feet long, providing first deck area of 226,000 square feet, and second deck area of 186,060 square feet. The total expenditure on this project is estimated at \$4,000,000. G. Sproul, Bourse Building, is director and engineer.

Breakwater, Milwaukee, Wis.—The Park Board are having revised plans prepared for constructing a 200 lin. ft. rubble mound breakwater on Lake Shore Drive, Section 3. The former bids were returned unopened.

Dock Wall, Buffalo, N. Y.—The Public Works Commission, Municipal Building will receive bids until August 22nd for constructing a concrete dock wall in Buffalo harbor from Jersey to Maryland Streets, also improving the channel and constructing a dock wall in Buffalo River. G. N. Norton, Municipal Building is engineer.

FOREIGN ACTIVITIES

COST OF SHIP CONSTRUCTION IN AUSTRALIA.

The following particulars of the cost of vessels which have been or are being constructed in Australia for the Commonwealth mercantile fleet have been given in the Australian House of Representatives by the Minister in Charge of Shipbuilding. Of seven vessels completed, varying from 5,604 to 6,170 tons, the actual building costs have ranged from about £29 (approximately \$141 at the normal rate of exchange) to £30 (approximately \$145 at the normal rate of exchange) per ton. The estimated cost of a 6,155 ton ship, which had run her trial trip, and of two others of the same size which were nearly ready, was put at £29 (\$141) per ton, but for two others also of 6,155 tons, which were not so far advanced, the estimated cost was £30 (\$145) per ton. For three others of the same tonnage, the hulls of which were well advanced and the machinery partly constructed, the same figure was given. The material for four more ships of 6,155 tons and for two of 12,700 had been ordered and the machinery was in varying stages of manufacture, some of it being well advanced. It is not proposed to build any more vessels for the Commonwealth Government line, in addition to those referred to above, all of which were decided upon more than two years ago.

SCOTTISH SHIPBUILDING IN JULY.

During the month of July 13 vessels of 29,449 tons, as compared with 16 vessels of 65,316 tons for the same month of the year 1920, were launched on the Tyne. The output for the first seven months of the present year consist of 131 vessels of 265,248 tons, compared with 115 vessels of 352,262 tons for the same period last year. In 1913, 146 vessels of 377,270 tons were launched by Clyde shipbuilders for the same period, or well over 100,000 tons more than for the corresponding period of the present year.

TYNE SHIPBUILDING OUTPUT.

The output from the shipyards on the Tyne, England, for the past six months, January to June 30, amounted to 38 vessels of 111,971 total estimated net register tons, as against 46 vessels of 123,938 tons for the corresponding period of last year.

LAUNCHINGS.

British Trader.—The oil carrying steamer British Trader, built to the order of the British Tanker Company, Ltd., was launched in July from the yard of William Beardmore & Company, Ltd., Dalmuir. The vessel is 350 feet by 49 feet by 27 feet, and of 6,000 tons deadweight, with a speed of 10 knots.

Huntsman.—The cargo steamer Huntsman, built for Messrs. T. & J. Harrison, Ltd., of Liverpool, was recently launched from the yard of Charles Connell & Company, Ltd., Scotstoun, Glasgow. Her dimensions are 482 feet 6 inches by 58 feet 3 inches, by 33 feet 3 inches. She is of 12,000 deadweight tons. Her propelling machinery, which was constructed by Messrs. Dunsmuir & Jackson, Ltd., Govan, consists of double-reduction geared turbines.

Scottish Maiden.—The twin-screw motor-driven oil carrying vessel Scottish Maiden, built to the order of Messrs. Tankers, Ltd., was recently launched from the yard of Vickers, Ltd., Barrow-in-Furness. She is a vessel of 10,050 deadweight tons, 425 feet by 56 feet 8 inches, by 33 feet molded to upper deck. The propelling machinery consists of two sets of Vickers heavy oil internal combustion engines of 2,500 brake horsepower. The Scottish Maiden is the second of four similar vessels building by Messrs. Vickers for the same owners.

City of Pittsburg.—The cargo steamer City of Pittsburg, built for the Ellerman Lines, Ltd., London, was recently launched by the Palmers Shipbuilding & Iron Company. She is 465 feet 9 inches in length, 58 feet 3 inches breadth, molded, by 34 feet 6 inches molded to upper deck, and of 12,100 tons deadweight.

Gunga.—The self-propelling suction dredger Gunga, built to the order of the Commissioners for the Port of Calcutta, was recently launched from the yards of William Simons & Company, Ltd., Renfrew. This vessel, which is the largest dredger ever constructed on the Clyde, has a hopper capacity of 80,000 cubic feet. She is 370 feet in length, 57 feet 6 inches in breadth by 24 feet 6 inches depth. The hull and machinery are constructed to Lloyd's highest class. The dredger is fitted with Simons patent sand baling arrangement.

Wilhelm Hemsoth.—The steamer Wilhelm Hemsoth was recently launched from the yard of the Deutschen Werke, A. G., Kiel. The ship is the second of four freighters building for Sloman & Company, Hamburg. The vessel is of the shelter deck type and embodies the most modern design and equipment. She is of 8,800 tons.

Binnendyk.—The 10,000 ton steamer Binnendyk has been launched from the Werft de Noord in Ablasserdam for the order of the Holland Amerika Line.

Waalveer.—The steamer Waalveer, building for the account of the N. V. M. J., van der Eb's Caradoorskantoor of Rotterdam was recently launched from the N. V. Sheepsaerf "Der Amer" in Geertruidenberg. The vessel is built to Lloyd's highest class and in conformity with the Dutch Shipping Inspection Laws. She is of the single deck type, measuring 237 feet 6 inches by 36 feet 3 inches, 46 feet 5 inches, and has a carrying capacity of 2,250 tons deadweight. The triple expansion engine of 900 indicated horsepower is to be delivered by the N. V. Kuypers Machine Fabriek, Rotterdam.

Guaraja.—The steamship Guaraja, built by the Societe des Forges et Chantiers de la Mediterranee for the Societe Generale de Transports Maritimes, was launched recently at Marseilles. This vessel, which was originally intended for a cargo steamer, is now to be fitted as a combination freight and passenger steamer. She has been constructed to the highest class of the Bureau Veritas. Her dimensions are: Length between perpendiculars, 361 feet; breadth, 46 feet; depth, 26 feet. She has a displacement of 7,760 tons and a deadweight capacity of 5,600. Her propelling machinery consists of steam turbines working in conjunction with electrical motors on the Ljungstrom system. This vessel will be used in the trade between Marseilles and South America.

Cargo Carrier.—Messrs. Jonker & Stans recently launched a steel cargo carrier of 3,200 tons deadweight from one of their yards at Hendrik-Ido-Ambacht, to the order of the Bureau Wijsmuller's Shipping Transport & Seagoing Tug Company, The Hague. The vessel is 275 feet in length, by 40 feet breadth and 20 feet 6 inches depth, and built

to Lloyd's classification of 100A-1. She will be provided with the most modern freight handling machinery.

Aldabi.—The steamship Aldabi was launched from the yard of the Deutsche Werft, Hamburg, Germany, on July 16. The vessel is being built for the account of the N. V. Van Nierevelt, Goudriaan & Company's Stoomvaart Mij., of Rotterdam. She is the first of three vessels being built at this yard for the same owners.

CONSTRUCTION AND REPAIR.

Huge Cruisers, Great Britain.—The House of Commons, London, recently voted in favor of the government program to build four new capital ships to take the place of obsolete vessels, the completion of which was not planned before the year 1925.

New Steamers, Ireland.—According to David Barry, D. B. E., general manager of the British & Irish Steam Packet Company, Ltd., two new steamers are in course of construction for the Dublin, Liverpool and Manchester trades. It is understood that these vessels are being built at one of the yards of Harland & Wolff.

Reconditioning Steamer, Belfast, Ireland.—One of the most extensive reconditioning jobs carried out by Messrs. Workman, Clark & Company, Ltd., at Belfast, since the war was recently completed on the passenger and cargo steamer Nestor, which was built by them in 1913 for the Ocean Steamship Company to serve their Australian route. Her dimensions are 563.25 feet long, 68.43 feet breadth, and 31.20 feet depth, with a gross tonnage of 14,500. The machinery, which has also been thoroughly overhauled, consists of two sets of triple expansion reciprocating engines with ample boiler power and the vessel has a speed of 11 knots.

Large Repair Contracts, Portsmouth, Eng.—Messrs. Cramptons (Shipbuilders), Ltd., have secured a contract for reconditioning the White Star liners Arabic and Suevic. The company has also secured a contract to fit out for the Ministry of Shipping two large troopships for service during the Indian troping season.

Oil Tanks, Kowloon, China.—Four large oil tanks are being constructed at the Kowloon Naval depot. Several months will be required for the completion of this work as it involves the laying of oil pipes and other facilities for the conveyance of oil aboard naval vessels.

Harbor to Be Reconstructed, Yokohama.—Surveying is already under way for the proposed reconstruction of Yokohama Harbor on a very large scale. About 1,000,000 taubo will be dredged, and when the reconstruction programme is completed Kanagawa is expected to develop rapidly as it will be in the center of the new harbor.

Oil Carriers, Gothenberg, Sweden.—Five specially designed oil carrying vessels are under construction at Gothenberg for the Grangesberg Oil Company. These vessels are each 385 feet in length and have a carrying capacity of 8,000 tons each. The vessel is propelled by two Diesel engines of 1,300 horsepower giving a speed of 11 knots. Cargo holds are all served by electrically operated winches.

Tugs and Lighters, Germany.—The Deutsche Levante Linie has ordered a tug and five lighters from the Norderwerft. One of the lighters, the Bossfelde, is ready for delivery.

GENERAL NOTES.

Harbor Improvements, Graudenz, Poland.—A very extensive port project awaits the approval of the Polish Government. It is intended to extend the harbor to cover 4½ acres with 2,150 feet of quays, as well as to build warehouses and install freight handling equipment. The new facilities would be provided immediately behind the railway bridge on both sides of the Weichsel. The estimated cost of this project will amount to about 40,000,000 marks.

Progress of German Shipbuilding.—During the past six months 24 vessels, representing 142,000 tons, are reported to have been built in German shipyards for the Hamburg-Amerika Line; three steamers of 12,000 tons each have been built for the Stinnes Group; three of 9,000 tons each for the Deutsche Australische Line, two of 8,000 tons each for the Hansa Company, and in addition 18 further steamers have already been launched for Hamburg account and are in progress of fitting.

Market for Marine Specialties, France.—According to Paul de Villaine, Cercle Interallie, 33 Faubourg St. Honore, Paris, who is associated with a well-known firm of engineers, there is a great opportunity in France for American marine specialties of all kinds. Mr. de Villaine writes that owing to labor conditions in England, where these specialties were formerly purchased, there is a fine opening for making a personal canvass of French shipowners and shipbuilders.